

**MONTANA DEPARTMENT OF STATE LANDS**  
**ABANDONED MINES AND RECLAMATION BUREAU**  
**ABANDONED HARDROCK MINE PRIORITY SITES**  
**PROJECT REPORT**

**Park County (Emigrant District)**  
**Through**  
**Powell County (Ophir District)**





**Park County**

Emigrant	Allison	PA # 34-018
New World	McLaren Tailings	PA # 34-004
	Lower Glengarry	PA # 34-006
	Gold Dust	PA # 34-007
	Little Daisy	PA # 34-009
	McLaren Mine	PA # 34-010
	Black Warrior	PA # 34-079
	Upper Alice E.	PA # 34-085
	Fisher Creek No. 1	PA # 34-090
	Homestake No. 2	PA # 34-093

**Powell County**

Elliston	Charter Oak	PA # 39-003
	Lily/Orphan Boy	PA # 39-006
	Monarch	PA # 39-008
	Ontario Millsite	PA # 39-010
	Golden Anchor	PA # 39-012
	Hard Luck	PA # 39-014
	Kimball	PA # 39-018
	Sure Thing	PA # 39-020
	Julia	PA # 39-022
	Telegraph Mine	PA # 39-023
	Third Term	PA # 39-024
	Anna R./Hattie M.	PA # 39-044
	Mountain View	PA # 39-062
Powell	Viking	PA # 39-077
Emery	Emery	PA # 39-004
Orphir	NE NW S32	PA # 39-052

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**PARK**

**EMIGRANT**







EMIGRANT





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MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ALLISON PA#: 34-018

Date: August 12, 1993 Time: 1045-1330

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; warm; cool, wet  
spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #35: GW-1 sample  
location; #36: WR-1; #1 WR-1 from top; #2: Discharge on WR-1; #3:  
WR-2; #4: WR-1 from bottom; #5: GW-2 sample location.  
Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site was gained by truck.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Water  
treatment may be required; study remedial alternatives. Amend and  
revegetate dump material.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ALLISON PA#: 34-018

Legal Description: T 7S ; R 9E ; Sec. 6 , SW 1/4 NE 1/4 1/4

County: PARK Mining District: EMIGRANT

Latitude: N 45° 15' 28" Longitude: W 110° 40' 02"

Primary Drainage Basin and Code: Yellowstone River/10070002

Secondary Drainage Basin: Emigrant Creek

USGS Quadrangle map name(s): Emigrant

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Molybdenum

Activity Status: Active     , Inactive/Exploration     , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): David Amsk, 508  
East Callender, Livingston, MT 59047. (406) 222-3817; Gallatin  
National Forest, P.O. Box 130, Bozeman, MT 59771.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Small miner exclusion permit held by  
Emil and Donna Jenneson until March 19, 1993.

General site features: Elevation 7800' , Slope 31° ,  
Aspect Eastern

Land use: Mining X , Recreational X , Residential     , Urban     ,  
Agricultural     , Other (Specify)    

Area of disturbed/unvegetated lands? 1.5 acres.  
Dimensions:    

Predominant vegetation types: Douglas fir, Lodgepole pine, spruce,  
grouse whortleberry

Access: roads - good     , poor     , 4wd X , trail     .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies above perennial Emigrant Creek  
on its east side.

Mining/milling history, ore type/tenor, host rock, gangue:   
Exploration began in 1885, when lower adit was driven-worked until  
1914; exploration and development work through present. Vein  
workings assayed 0.24% to 0.42% molybdenum. Best mineralization  
limited to pipe-like zone of brecciated rock which is described as  
trachyte porphyry, coarsely porphyritic and dense, flow-banded  
rhyolite, or dacite porphyry.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 2, Comment Caved  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: Literature says small mill was installed,  
but removed prior to 1943; no mill evidence seen on-site.

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A



Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:7931	07S 09E 05 BACD	0.0	150.0	0.00







PIONEER  
TECHNICAL SERVICES, INC.

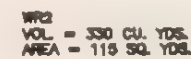
YA-1988

SCALE: 1" = 1000'






EMIGRANT CREEK ROAD



ALLISON PA# 34-018  
EMIGRANT DISTRICT PARK COUNTY

SHEET NO.

DRAWN JTP DATE 15 NOV 83  
DESIGNED TPR JOB NO. 93-17  
APPROVED WJB F.B. NO. \_\_\_\_\_

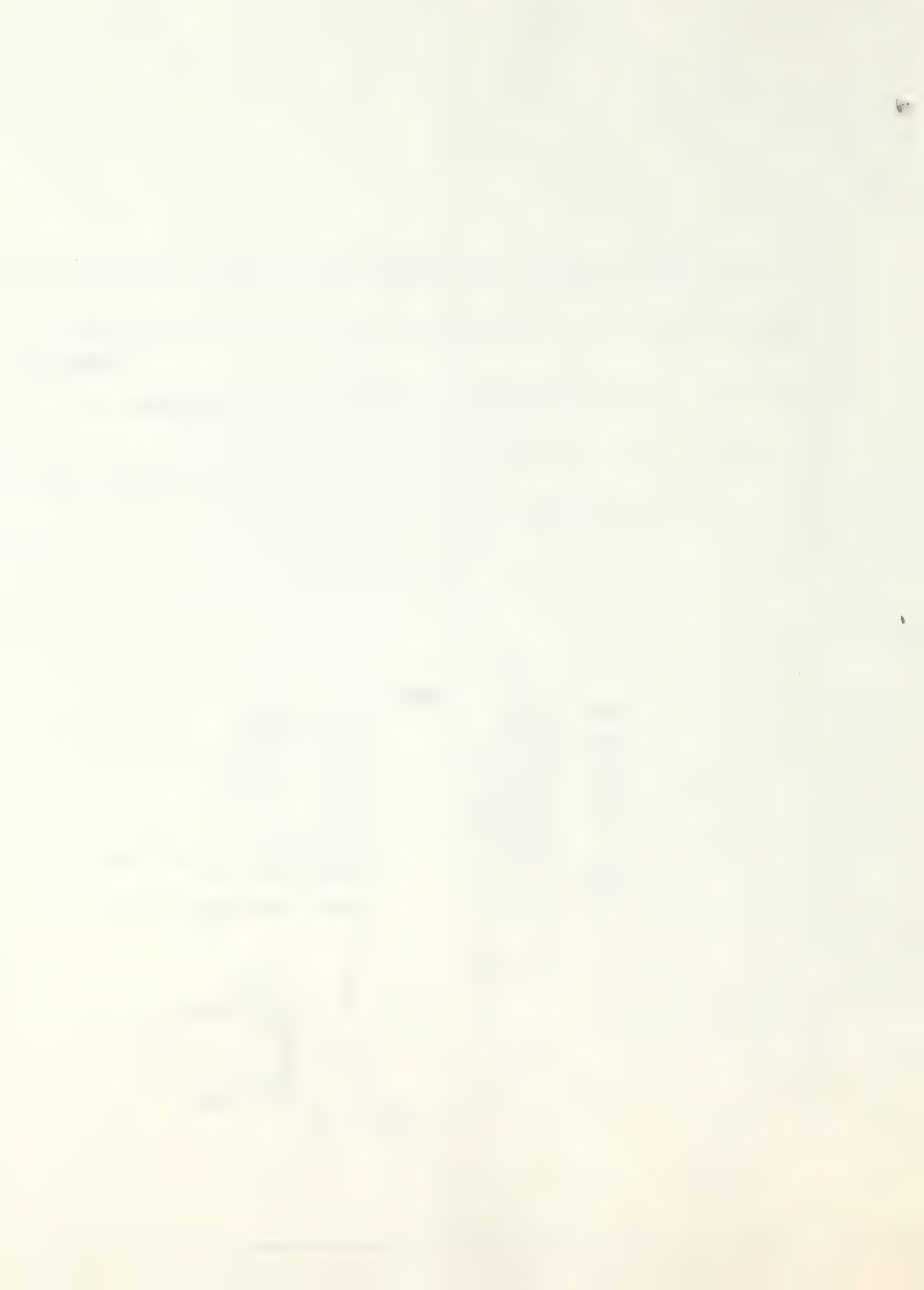


PIONEER

# Index

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA  
SPOKANE WASHINGTON

34-018.DWG SHEETS



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay):  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





**SAMPLERS:** Bullock, Belanger

[illegible]

D-Direct reading (Galvey Meter); S-Saturated Paste (Ordon Meter)

**Comments or deviations from SOPs:** 34-018-WR-1 is a composite of WR-1A, WR-1B, WR-1C, WR-1D. 34-018-WR-2 is a composite of WR-2A and WR-2B.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Flow from adit associated with WR-1

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes X, No     , Number: 1 Identification: Borehole flowing; sampled as GW-2.

Groundwater wells within 4 miles?: Yes X, No     ;  
Number of well logs: 13

Distance to nearest well used for drinking? One resident within 1 mile of the site (upgradient) apparently has a well.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable     , Possible X, Unlikely     .

Possible due to elevated metal values in WR-1 and adit discharge water infiltrating into the waste rock.

Other observations/notes: N/A



**SAMPLERS:** Bullock, Belanger

[illegible]

FROM: Nationalized (N) or Measured (M) from oldt. shift. sum of entries?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Dry streambeds: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Other surface water: Yes\_\_\_\_, No X, Name(s)/Description:\_\_\_\_\_

Waste materials within any floodplain: Yes\_\_\_\_, No X Source ID(s):\_\_

Approximate Flood frequency?\_\_1 yr,\_\_10 yr,\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow:\_\_\_\_\_, Average Flow:\_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)?  
N/A

Surface water draining onto or through waste sources: Yes\_\_\_\_, No X,  
Describe:\_\_\_\_\_

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Stock watering, irrigation, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_,  
No X, Distance downstream (ft)?\_\_\_\_\_ Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present):  
Not attributable directly to the Allison site; Emigrant Creek has been  
disturbed by past placering activities.



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 4 acres

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes , No X , Describe:

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30   ; 30-100   ;  
100-300   ; 300-1,000   ; 1,000-3,000   ; 3,000-10,000   ; 10,000 or  
greater   ; Comments   

Nearest residence(ft or miles)? 1 mile (recreational)

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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**SAMPLERS:** Bullock, Belanger

### Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe:\_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments\_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Grizzly, Peregrine  
Falcon  
Bat Habitat - Yes\_\_\_\_, No X, Comment\_\_\_\_\_

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 4  
Sport Fishery Classification - 4

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_

## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Park County, Montana, Information Circular 7546, Written by Glenn C. Reed, February 1950.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Allison, Prepared by Northern Engineering and Testing, June 23, 1987.

USGS, Topographic Map, Emigrant, Montana, 7 1/2 minute Quadrangle, 1988.





LABORATORY ANALYTICAL DATA

ALLISON  
PA NO. 34-018



**Allison PA# 34-018**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BULLOCK**  
**INVESTIGATION DATE: 08/12/93**

**SOLID MATRIX ANALYSES**

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-018-WR-1	15.5	59.1 J	0.92 J	2.63	1.54	416	25800	0.114	365	3.17	232	6.24 UJ	80.5	NR
34-018-WR-2	31.1	72.6 J	1.01 J	7.44	3.89	385	46800	1.14	329	4.55	126	5.41 UJ	119	NR
BACKGROUND	32.8	175 J	1.32 J	3.87	10.4	165	29500	0.028 U	484	9.84	242	6.52 UJ	96.5	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL			SULFUR			PYRITIC			SULFUR		
	SULFUR %	ACID BASE t/1000x	NEUTRAL. POTENT. t/1000x	ACID BASE POTENT. t/1000x	SULFUR %	SULFATE %	ORGANIC SULFUR %	SULFUR ACID BASE t/1000x	PYRITIC ACID BASE t/1000x	SULFUR ACID BASE POTENT. t/1000x	SULFUR ACID BASE POTENT. t/1000x	SULFUR ACID BASE POTENT. t/1000x
34-018-WR-1	0.65	20.3	-0.21	-20.5	0.30	0.30	0.33	0.62	-0.83	-0.83	-0.83	-0.83
34-018-WR-2	0.21	6.56	-0.26	-6.82	0.14	0.14	0.08	0.00	-0.26	-0.26	-0.26	-0.26

**WATER MATRIX ANALYSES**

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
34-018-GW-1	4.1	9.57	2.83	12.1	6.83 U	268 J	12500	0.120 U	989	25.7	1.84	30.7 U	1050	20.2
34-018-GW-2	18.3	18.4	4.63	9.7 U	6.83 U	2.3 J	15100	0.120 U	684	20.2	21.5	30.7 U	2190	111

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-018-GW-1	189	< 5.0	77	< 0.05	NR
34-018-GW-2	216	< 5.0	77	< 0.05	NR

**LEGEND**

WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
 WR2 - Composite of subsamples WR2A and 2B.  
 BACKGROUND - From the Allison Mine (34-018-SS-1).  
 GW1 - Discharging adit associated with waste rock dump 1.  
 SW1 - Discharge from bore hole at base of waste rock dump 1.





**XRF ANALYSIS RESULTS**

**ALLISON  
PA NO. 34-018**





Mine Name: Allison PA# 34-018  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-018-SS-1		22807.8	7176.12	2144.88		1401.79	41021.7	377.775 *	161.14 *	184.193	43.812 *	149.103
34-018-WR1-A		34765.6	1555.51	671.621	170.793 *	642.233 *	9953.33			40.0435 *	42.5367 *	27.1203
34-018-WR1-B		32689.6	4610.71	2046.8		2869.09	60087		4237.47	585.882		125.739
34-018-WR1-C		26867.4	1121.58	804.309	217.472 *	377.961 *	19075.8			36.1172 *	32.8545 *	63.1794
34-018-WR1-D		30212.9	1259.46	950.014			108067		230.605 *	74.6461 *		58.7102
34-018-WR2-A		28640.6	3007.64	1604.13		710.876 *	46279.9		279.759	119.906 *	72.5338 *	124.104
34-018-WR2-B		31534.6	1982.91	835.594		631.92 *	45639.2		219.156	90.7556 *	63.6963 *	108.567
34-018-WR-1-COMP		28267.4	2851.01	923.221		1154.85	39562.9		772.957	179.637		55.6597
34-018-WR-2-COMP		34738.4	3069.62	1425.11		645.811 *	41568.2		220.568	100.055 *	46.234 *	118.035
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
34-018-SS-1	212.55		268.768	213.712	190.109			953.482			27.876	
34-018-WR1-A	238.158		2419.14	193.381	311.694			265.143			61.0194	
34-018-WR1-B	182.986		140.396	817.732	243.408			1221.49			32.6096	
34-018-WR1-C	203.747		435.589	70.0972	187.285			658.561			33.6712	
34-018-WR1-D	229.663		495.146	224.908	262.687			1033.82			23.6555	
34-018-WR2-A	274.136		349.437	58.9538 *	212.529			1062.63			29.7395	
34-018-WR2-B	297.219		430.659	63.2224 *	236.9			954.316			36.5387	
34-018-WR-1-COMP	241.963		829.224	190.881	241.015			626.572	124.794 *		34.5402	
34-018-WR-2-COMP	291.893		353.732	57.5419 *	212.289			1043.24			34.5566	

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

ALLISON  
PA NO. 34-018





# AIMSS SCORESHEET

SITE NAME:  
PA NUMBER:

ALLISON  
34-018

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 7.301
6	GW - TARGETS	WELLS - 1 MI. x 2.5	2.5
7		WELLS - 1 TO 4 MI	12
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 14.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 42346
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 9.015
16	SW - TARGETS	DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	0
19		FISHERY	1
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 THRU 22 13
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 4688
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 50
27		LIKELIHOOD SCORE	LINES 25 + 26C 50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.001
29	AIR - TARGETS	POPULATION - 4 MILES	1
30		NEAREST RESIDENCE	0
31		WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 THRU 33 16
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 1
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.000
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	1
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 THRU 42 1
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 0
45		TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000 0.47

		SITE NAME:		ALLISON
		PA NUMBER:		34-018
LINE NO.	SITE SAFETY			
1	THREAT	ACCESSIBILITY		20
2	HAZARDS	OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4		UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8			HAZARDS SCORE	SUM LINES 2 THRU 7
9	TARGETS	POPULATION - 1 MILE		1
10		NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000	0.00





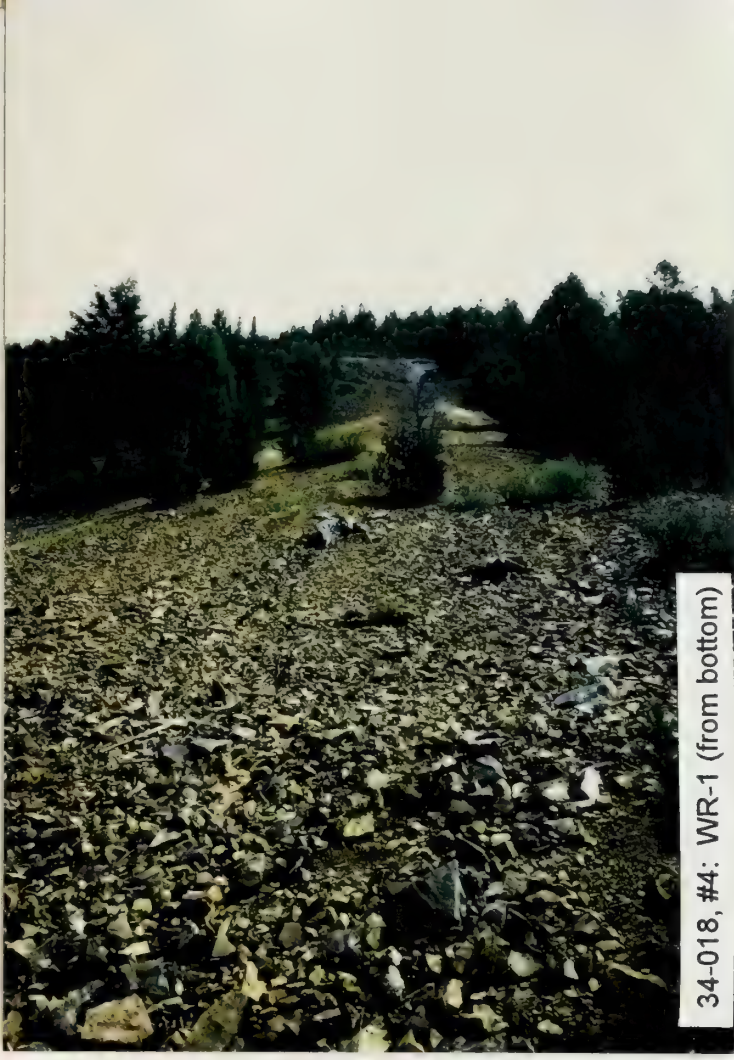
34-018, #1: View from top of WR-1



34-018, #2: WR-1 and adit discharge



34-018, #3: WR-2 in distance



34-018, #4: WR-1 (from bottom)





34-018, #35: GW-1 sample location

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34-018, #5: GW-2 sample location



34-018, #36: WR-1







MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MCLAREN TAILINGS PA#: 34-004

Date: August 10, 1993 Time: 0800

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Clark, Pioneer

Visitors: Earl McCurley, MDSL

Weather/Seasonality Observations: Sunny and warm; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #7: SW-1 downgradient Soda Butte Creek; #8: WR-1; #9: TP-1; #10: WR-1 and tailings; #11: GW-1 sample location; #12: SW-3 on Soda Butte Creek; #13 SW-2. Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site by truck. Site lies 0.25 miles out of Cooke City and has been reclaimed. Fish observed in Soda Butte Creek at the stream crossing (upstream from the tailings).

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study to determine water treatment requirements and alternatives.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MCLAREN TAILINGS PA#: 34-004

Legal Description: T 19S ; R 14E ; Sec. 25 , S 1/2 NE1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 01' 34" Longitude: W 109° 55' 29"

Primary Drainage Basin and Code: Yellowstone River/10070001

Secondary Drainage Basin: Soda Butte Creek

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Mill Tailings

Activity Status: Active ☐ , Inactive/Exploration ☒ , Abandoned ☐ .

Ownership status: Known ☐ ☒ ☐ ; private/public? Private/Public

Owner, Agent, or Contact (Include address and phone when available): Marlys

Hunziker, 13808 16th SW, Seattle, WA 98166. (206) 242-7383; Rury,

4 Stone Road, Binghamton, NY 13903. (607) 722-3877; Camjac, Inc.,

501 Plaza, Great Falls, MT 59401; Judy Barker, 17223 Hidden Glen,

Dallas, TX 75200; Gallatin National Forest.

Relationship to other mines/sites in the area/district: Approx.

1 mile south of the Upper Alice East mine

Regulatory Status (Activity by other agencies)? Hardrock permits?

Past Reclamation Activities? Reclamation activities have been

previously conducted under an USEPA removal action. This site is

currently listed under the CECRA Program.

General site features: Elevation 7620' , Slope 5° ,

Aspect West

Land use: Mining ☐ , Recreational ☒ , Residential ☒ , Urban ☐ ,

Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 3 acres.

Dimensions: There are 13 acres of reclaimed tailings and 1.5 acres

of WR-1.

Predominant vegetation types: Lodgepole pine, willows, aspen,

grasses, shrubs

Access: roads - good ☒ , poor ☐ , 4wd ☐ , trail ☐ .

Other logistical considerations (proximity to other sites). Site

is adjacent to the highway and accessible.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBOG Well Log Printout(s): There are 23 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Tailings lie on the south side of  
perennial Soda Butte Creek and WR-1 lies on north side of the  
creek. Miller Creek flows from the north into Soda Butte Creek,  
below WR-1 and about midway down the tailings. Soda Butte Creek  
flows west-southwest through the site.

Mining/milling history, ore type/tenor, host rock, gangue: The  
McLaren Concentrator was a combined floatation-gravity plant having  
a nominal capacity of 200 tons per day. Typical concentrates were  
reported to have contained 1.2 ounces of gold and 11% copper per  
ton.

Mine Operation?

Shafts - Yes     , No X, #     , Comment                       
Adits - Yes     , No X, #     , Comment                       
Pits - Yes     , No X, #     , Comment                       
Placers - Yes     , No X, #     , Comment                       
Other - Yes     , No X, #     , Comment                     

Mill Operation? Yes X, No     . If yes answer the next three  
questions:

Period(s) of Operation: Not given in available literature

Origin of Ore Milled - Custom Mill      Dedicated Mill X; Number and  
names of mines that supplied mill feed: Numerous mines in area  
contributed to the mill. A 1977 DNRC report indicated 300,000 tons  
of tailings from Kennecott.

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting?  
Floatation/gravity



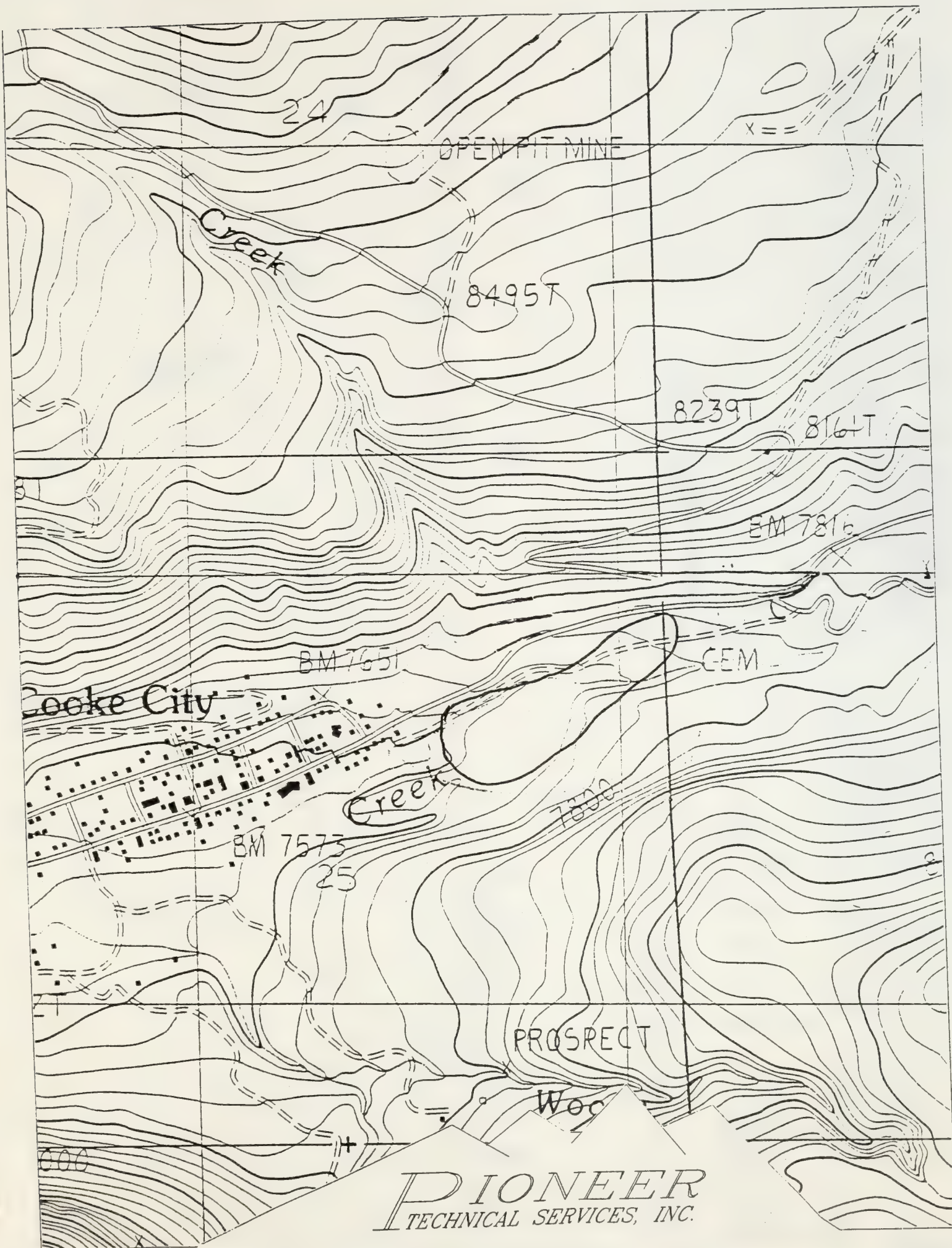
Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:106002	09S 14E 25	180.0	10.0	5.00
M:106003	09S 14E 25	61.0	0.0	0.00
M:8297	09S 14E 25 AC	10.0	0.0	4.40
M:8299	09S 14E 25 AC	18.0	0.0	7.10
M:8300	09S 14E 25 AC	21.0	0.0	5.20
M:8303	09S 14E 25 AC	15.0	0.0	7.10
M:8298	09S 14E 25 AC	12.0	0.0	10.80
M:8308	09S 14E 25 ACDA	21.0	0.0	5.40
M:8309	09S 14E 25 ACDA	0.0	0.0	12.40
M:8307	09S 14E 25 ACDA	0.0	0.0	9.20
M:8326	09S 14E 25 ADBD	10.0	0.0	7.20
M:8327	09S 14E 25 ADCA	0.0	0.0	9.80
M:8329	09S 14E 25 ADCB	0.0	0.0	12.60
M:8331	09S 14E 25 ADCB	0.0	0.0	7.30
M:8332	09S 14E 25 ADCC	0.0	0.0	7.80
M:106004	09S 14E 25 B	49.0	40.0	20.00
M:106005	09S 14E 25 B	49.0	40.0	0.00
M:106006	09S 14E 25 BDD	145.0	0.0	0.00
M:26187	09S 14E 25 CBB	45.0	60.0	24.00
M:121237	09S 14E 25 CBB	71.0	30.0	42.00
M:106007	09S 14E 26	240.0	3.0	0.00
M:125781	09S 14E 26 DAA	80.0	40.0	46.00
M:106075	09S 15E 30 ABBD	45.0	20.0	20.00





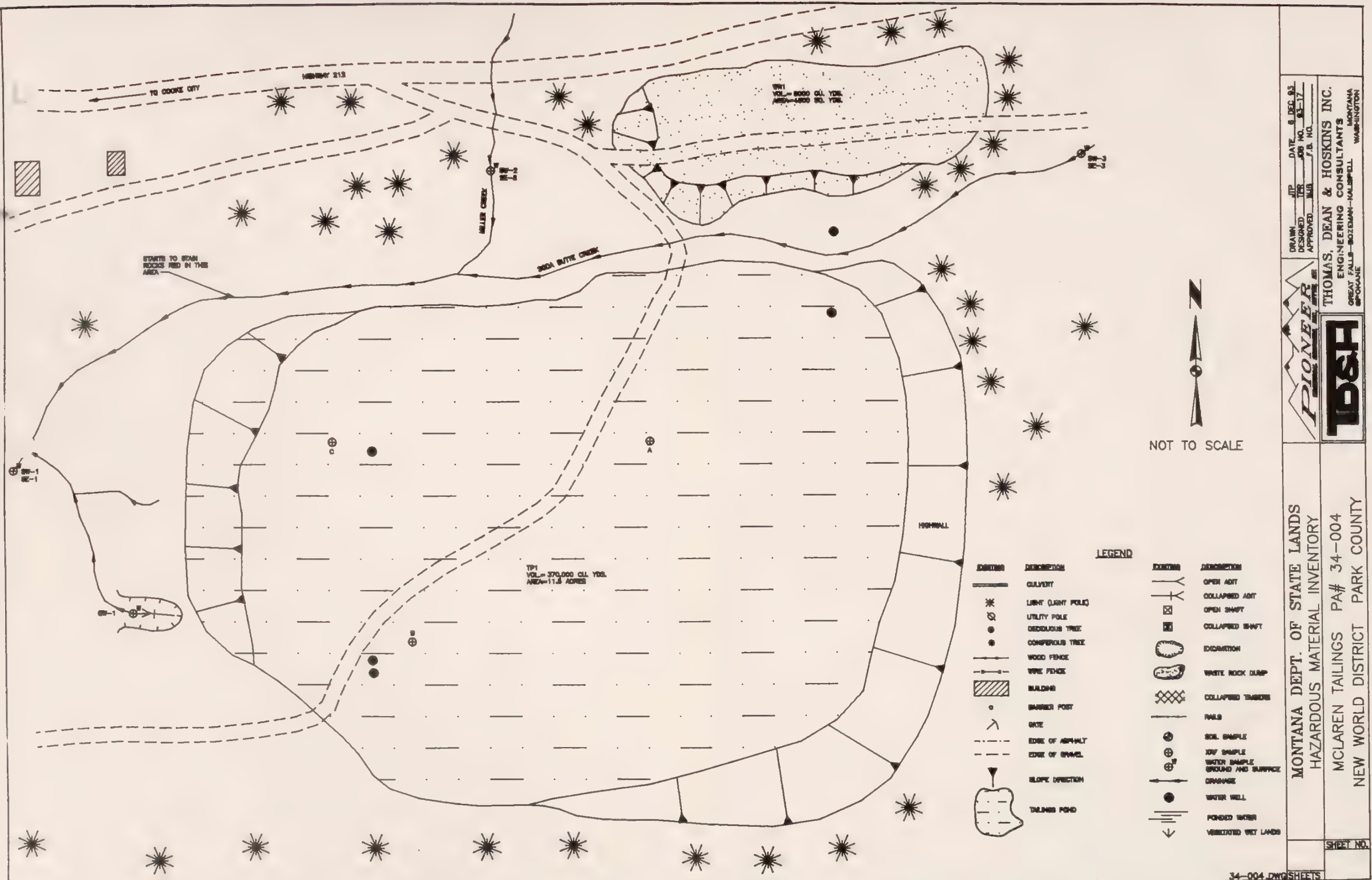


**PIONEER**  
TECHNICAL SERVICES, INC.

MCLAREN TAILINGS, P.A. NO. 34-004  
T09S, R14E, SECTION 25  
SCALE: 1" = 1000'







DRAWN: JTP DATE: 8 DEC 93  
DESIGNED: JTP JOB NO.: 93-17  
APPROVED: MJB F.B. NO.:  
THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

**PIONEER**  
**TDSH**

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
MCLAREN TAILINGS PA# 34-004  
NEW WORLD DISTRICT PARK COUNTY

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
Reclaimed \_\_\_\_\_

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Approx. 20 feet deep at the lower end. Top is coversoil; 2.5 to 4.0 feet is brown/gray, marbled sand; 4 to 13 feet is gray silty sand; 13 to 16 feet is wet silt; 16 to 18 feet is coarse material.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Dam has been resloped and seeded. Some erosional features have developed from seeps at the toe of the dam.

Comments on potential for mitigation: Determine additional measures necessary to withstand flood events. Also study water treatment alternatives.





# **SOURCE INVENTORY FORM**

SAMPLERS: Bullock, Belanger, Clark

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	8,000	On reclaimed waste rock closest to highway	Vegetation	6.1 (D)	0.05	34-004-WR-1	08/10/93 1540	T-Metals, ABA
WR-1B	WR		On reclaimed waste rock closest to highway	Vegetation	4.9 (D)	0.045			
WR-1C	WR		On reclaimed waste rock closest to highway	Vegetation	6.5 (D)	0.045	N/A	N/A	XRF Analysis
TP-1A-A	TAIL	370,000	483 feet south of north edge, just below WR-1; 0-2'	Vegetation and Dam	< 3.5 (D)	0.03	34-004-TP-1	08/10/93 1600	T-Metals, ABA
TP-1A-B	TAIL		483 feet south of north edge, just below WR-1; 2-3.5'	Vegetation and Dam	< 3.5 (D)	0.03	34-004-TP-2	08/10/93 1610	T-Metals, ABA
TP-1B-A	TAIL		Central, near dam; 0-2.5'	Vegetation and Dam	6.1 (D)	0.035			
TP-1B-B	TAIL		Central, near dam; 2.5-4'	Vegetation and Dam	< 3.5 (D)	0.03			
TP-1B-C	TAIL		Central, near dam; 4-13'	Vegetation and Dam	< 3.5 (D)	0.03			
TP-1B-D	TAIL		Central, near dam; 13-16'	Vegetation and Dam	< 3.5 (D)	0.03			
TP-1B-E	TAIL		Central, near dam; 16-18'	Vegetation and Dam	< 3.5 (D)	0.05			
TP-1C-A	TAIL		North end near dam; 0-4', oxidized	Vegetation and Dam	5.0 (D)	0.03			
TP-1C-B	TAIL		North end near dam; 4-12', gray sand	Vegetation and Dam	5.0 (D)	0.03			
TP-1C-C	TAIL		North end near dam; 12-15'; gray sandy/silt	Vegetation and Dam	5.0 (D)	0.05			

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs:** See McLaren Mine (34-010) for background soil sample. 34-004-WR-1 is composite of WR-1A and -1B. 34-004-TP-1 is composite of TP-1A-A, TP-1B-A, and TP-1C-A. 34-004-TP-2 is composite of TP-1A-B, TP-1B-B through -1B-E, and TP-1C-B and -1C-C.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes X, No\_\_\_, Number: 1 Identification: Seepage at toe of tailings dam; sampled as GW-1.

Groundwater wells within 4 miles?: Yes X, No\_\_\_;  
Number of well logs: 111

Distance to nearest well used for drinking? Approx. 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable X, Possible\_\_\_, Unlikely\_\_\_.

Elevated metal values in tailings and waste rock; waste material is in contact with alluvial groundwater. Seep has bright iron-staining.

Other observations/notes: Residents directly downgradient of site are on the city water supply.



**SAMPLERS:** Belanger, Clark

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Purged three bore volumes from the monitoring well prior to sampling.

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Soda Butte Creek and Miller Creek

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes     , No X Source ID(s): Diverted away from tailings and dump

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 15 during investigation  
High Flow: 150 cfs, Average Flow: 15 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Soda Butte Creek flows along the northern edge of the tailings impoundment.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Probable irrigation and residential uses; recreational; wilderness; habitat for Grizzly Bear, probable habitat for Gray Wolf and Bald Eagle; fishery; wetlands; national park

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? 250 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Iron-staining of streambed for approx. 250 feet along and below the tailings impoundment.



**SAMPLERS:** Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH  $\leq$  5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 14 acres

Wetlands present: Yes X, No     , Describe: Below tailings dam is  
approximately 1 to 2 acres of wetlands.

Carbonate rocks/soils: Yes , No X , Describe:

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_;  
100-300 X; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or  
greater\_\_\_\_; Comments\_\_\_\_\_

Nearest residence(ft or miles)? 50 feet

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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## ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Bullock, Belanger, Clark

[illegible]

### Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No     ,  
Describe: Residents approx. 50 feet from base of tails dam.

Population within 1 mile: 1-10     ; 10-30     ; 30-100 X; 100-300     ;  
300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ;  
Comments     

Evidence of recreational use on site: Yes X, No     , Describe: Off-  
road vehicle tracks; shell casings; tourists observed on the site.

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u>X</u> , No <u>    </u> , Comment <u>Yellowstone</u>
Wilderness Area -	Yes <u>X</u> , No <u>    </u> , Comment <u>Absaroka/Beartooth</u>
T&E Species Habitat -	Yes <u>X</u> , No <u>    </u> , Comment <u>Grizzly</u>
Bat Habitat -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>

Primary Drainage     ; Secondary Drainage X; No Information     :

Riparian Habitat Quality -	High <u>X</u> , Medium <u>    </u> , Low <u>    </u>
Wetlands Frontage -	High <u>    </u> , Medium <u>X</u> , Low <u>    </u>
Fisheries Habitat and Species Classification -	<u>    </u> <u>4</u>
Sport Fishery Classification -	<u>5</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes     , No X, Number     , types and locations:     

Hazardous structures: Yes     , No X, Number     , types and locations:     

Unstable highwalls, pits, trenches, slopes: Yes     , No X, Number     ,  
types and locations:     

Unstable waste piles, impoundments, undercut banks: Yes     , No X,  
Number     , types and locations:     

Fire and/or Explosion hazards: Yes     , No X, Explain:



## Bibliography

Crown Butte, Hard Rock Permit Application, Summary of Water Quality Analyses, Prepared by Chen-Northern, March 15, 1991 through September 24, 1991.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory Form for McLaren Tailings, Prepared by Mark Carlstrom and Ben Mundie, September 26, 1979.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for McLaren Tailings, Prepared by Delta Engineering, Date Unknown.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1986.



**LABORATORY ANALYTICAL DATA**

**MCLAREN TAILINGS  
PA NO. 34-004**





McLaren Tailings PA# 34-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/10/93

SOLID MATRIX ANALYSES

Results per dry weight basis

Metals in soils

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-004-SE-1	10.6 J	86.2	0.61 U	11.9	14.4 J	214	20400	0.047	557	19.7	59.1	7.24 UJ	98.2	NR
34-004-SE-2	7.37 J	93.5	0.60 U	12.9	17 J	243	15400	0.035 U	504	23.1	55.1	7.11 UJ	98.7	NR
34-004-SE-3	4.12 U	88	0.45 U	7.91	13 J	103	20500	0.04 U	658	14.3	116	5.36 UJ	102	NR
34-004-TP-1	26.3 J	73.8	2.58	6.79	17.5 J	1700	107000	0.105	217	10.4	69	7.16 UJ	81.9	NR
34-004-TP-2	41.6 J	69.3	3.00	12.8	21.6 J	3680	163000	0.179	576	14.4	104	6.71 UJ	162	NR
34-004-WR-1	45.3 J	101	1.99	5.13	17.5 J	846	105000	0.099	191	8.87	208	6.18 UJ	80.1	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.058 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		NEUTRAL		SULFUR		PYRITIC		ORGANIC		SULFUR	
	SULFUR	ACID BASE	POTENT.	U/1000t	SULFUR	ACID BASE	POTENT.	U/1000t	SULFUR	ACID BASE	POTENT.	U/1000t
34-004-TP-1	6.10	191	116	-74.9	-431	2.89	0.76	0.37	0.82	220	-105	
34-004-TP-2	14.1	440	9.83	-3.22	-38.8	0.76	0.37	0.31	7.00	132	-122	
34-004-WR-1	1.14	35.6	-3.22	-38.8	0.76	0.37	0.31	0.31	0.37	0.31	-3.53	

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

HARDNESS  
CALC.

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)
34-004-GW-1	1.57 JX	58.7	2.57 U	32	6.83 U	4.37 JX	117000	0.29	4240	26.5 J	2.28 J	30.7 U	79
34-004-GW-2	1.43 JX	25	2.57 U	9.7 U	17.1	3.1 JX	96200	0.22	2010	12.7 U	2.95 J	30.7 U	75.7 U
34-004-SW-1	1.12 UJX	45.7	2.57 U	9.7 U	6.83 U	8.87 JX	827	0.22	82.8	12.7 U	3.2 J	30.7 U	9.1
34-004-SW-2	1.14 JX	29.3	2.57 U	9.7 U	6.83 U	8.5 JX	75.6	0.22	5.03	12.7 U	3.05 J	30.7 U	119
34-004-SW-3	1.84 JX	54.8	2.57 U	9.7 U	6.83 U	4.1 JX	32.8	0.4	5.77	15.7 J	2.3 J	30.7 U	13.8
													125

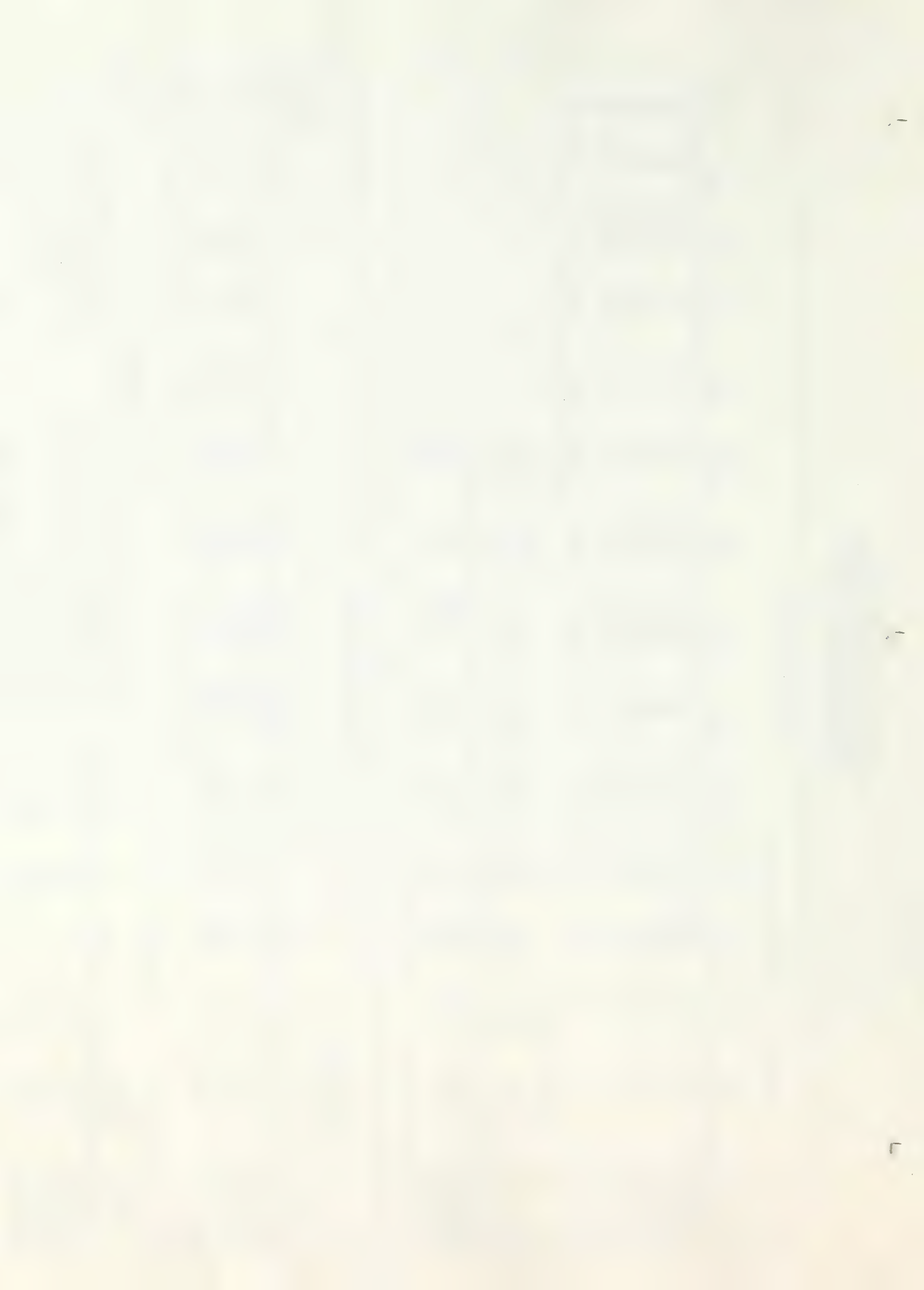
U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-004-GW-1	1180	5	692	< 0.05	NR
34-004-GW-2	4360	5	2660	< 0.05	NR
34-004-SW-1	165	< 5.0	25	< 0.05	NR
34-004-SW-2	115	< 7	21	< 0.05	NR
34-004-SW-3	155	< 5.0	7	< 0.05	NR

LEGEND

- SE1 - Downgradient on Soda Butte Creek.
- SE2 - Miller Ck. just above confluence with Soda Butte Creek.
- SE3 - Upgradient on Soda Butte Creek.
- TP1 - Composite of subsamples TP1A-A, 1B-A, and 1C-A.
- TP2 - Composite of subsamples TP1A-B, 1B-B, 1B-C, 1B-D, 1B-E, 1C-B, and 1C-C.
- WR1 - Composite of subsamples WR1A and 1B.
- BACKGROUND - From the Little Daisy Mine (34-009-SS-1).
- GW1 - Seepage at toe of tailings.
- GW2 - Monitor well at West end of tailings.
- SW1 - Same as sample SE1.
- SW2 - Same as sample SE2.
- SW3 - Same as sample SE3.





**XRF ANALYSIS RESULTS**

**MCLAREN TAILINGS  
PA NO. 34-004**



## XRF Field Analyses

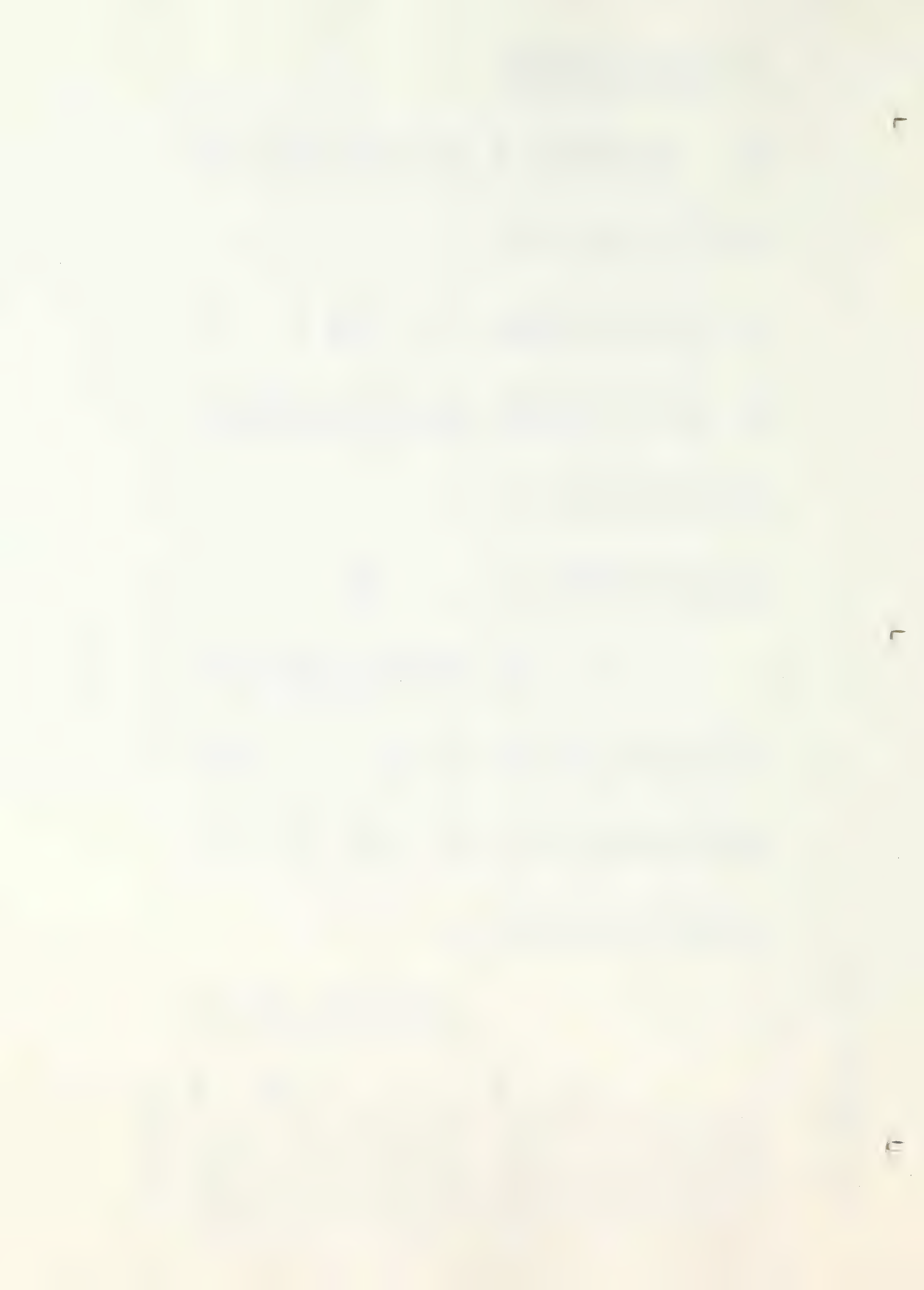
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-004-TP1A-A		20244.9	10026.7	1547.9		775.566 *	196034	1344.17 *	1131.77	191.476 *	59.0423 *	94.5804
34-004-TP1A-B		18805.3	12628.9	1831.21		549.44 *	210983	1715.75 *	3448.73	271.95	93.7085 *	80.9773
34-004-TP1B-A		11107.5	101757	1531.5		896.141 *	18650.3			51.4148 *		521.735
34-004-TP1B-B		18220.9	11879.9	1833.51		526.684 *	121963			113.542 *		112.635
34-004-TP1B-C		14487.4	12673.5	1229.53		980.775 *	149891			180.588 *		81.2395
34-004-TP1B-D		12508.2	13704.1	1017.72		1138.94 *	166724	1280.49 *	2464.59	178.497 *	74.0288 *	76.2054
34-004-TP1B-E		13687.2	14313.1	1248.76		1196.44 *	174280	1391.5 *	2204.99	204.633 *	65.7323 *	91.1613
34-004-TP1C-A		19606.3	11614	1325.4		638.9 *	165964	1261.38 *	651.996	115.444 *	75.4853 *	155.316
34-004-TP1C-B		13388.9	9985.66	927.269		716.435 *	192308	864.462 *	2598.58	233.511	85.0783 *	94.4025
34-004-TP1C-C		10501.5	7215.03	821.348	208.42 *	1043.89 *	207924	1429.92 *	1497.75	266.063	122.503 *	74.3349
34-004-TP-1-COMP		12799	17109.7	1254.08		864.252 *	122059	844.872 *	1171.35	80.6226 *	40.4917 *	151.324
34-004-TP-2-COMP		14912.6	11492.3	1433.35	199.315 *	1202.19 *	176118	1359.64 *	2556.45	221.273	76.0519 *	90.9145
34-004-WR1-A		18788.4	7179.36	1983.12		751.299 *	117001	897.104 *	477.834	110.42 *	57.499 *	294.939
34-004-WR1-B		13600	4639.87	1241.08		531.342 *	164441	811.601 *	765.697	130.138 *	65.1331 *	226.087
34-004-WR1-C		17319.1	7077.72	2045.29	181.296 *	1284.51	33758.4	286.352 *	241.02	158.962		348.528
34-004-WR-1-COMP		16883.8	5941.07	1615.41	167.098 *	428.138 *	139286	664.524 *	559.339	137.62 *	76.6507 *	224.603
Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th		
34-004-TP1A-A	54.3896	10.4892 *	41.712 *	120.409			378.517			15.2729 *		
34-004-TP1A-B	59.0335		39.8398 *	103.092			409.355	204.618 *		16.5389		
34-004-TP1B-A	108.155			58.1841			691.121			16.4834 *		
34-004-TP1B-B	59.2308	5.55582 *	97.6154 *	76.0251			367.758			17.8711		
34-004-TP1B-C	54.3542	7.15934 *	53.2562 *	74.4601			368.75			12.0058 *		
34-004-TP1B-D	44.3313	7.90447 *		59.9237	243.35 *		309.563	160.883 *		16.8397		
34-004-TP1B-E	38.5477	10.3807 *		58.1259 *	290.242 *		337.624	171.123 *		14.6972		
34-004-TP1C-A	88.6946			106.425			554.421	180.954 *		17.7909		
34-004-TP1C-B	59.1817	6.58958 *		69.9192			411.277			11.6145 *		
34-004-TP1C-C	26.9922	8.66669 *		65.4738 *			227.341	186.354 *		15.3423		
34-004-TP-1-COMP	56.6193	6.42397 *		74.1995		94.7743 *	620.887			19.6208		
34-004-TP-2-COMP	45.8258			74.5423			350.358			14.5419 *		
34-004-WR1-A	149.533		121.352	107.629			630.036			18.1914 *		
34-004-WR1-B	100.352	7.60713 *	250.466	91.3156			432.747			16.8336 *		
34-004-WR1-C	195.01		43.4098 *	114.384			703.695			26.4888		
34-004-WR-1-COMP	103.616	7.59749 *	165.524	105.084			457.418	126.286 *		16.0381 *		

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

MCLAREN TAILINGS  
PA NO. 34-004





# **AIMSS SCORESHEET**

SITE NAME: MCLAREN TAILINGS  
PA NUMBER: 34-004

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		10
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.968
6		WELLS - 1 MI. x 2.5		57.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		88
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	145.5
10		<b>GROUNDWATER SCORE</b>	LINES 4 x 5 x 9	144569
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		10
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	200
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	500
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	32.961
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	23
24		<b>SURFACE WATER SCORE</b>	LINES 14 x 15 x 23	379052
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	200
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.013
29		POPULATION - 4 MILES		100
30		NEAREST RESIDENCE		10
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		10
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	135
35		<b>AIR PATHWAY SCORE</b>	LINES 27 x 28 x 34	351
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		250
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	650
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.002
40	DIRECT CONTACT	POPULATION - 1 MILE		30
41	TARGETS	NEAREST RESIDENCE		10
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 THRU 42	50
44		<b>DIRECT CONTACT SCORE</b>	LINES 38 x 39 x 43	65
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b> (LINES 10 + 24 + 35 + 44) / 100,000			5.24

SITE NAME:  
PA NUMBER:

MCLAREN TAILINGS  
34-004

LINE  
NO.

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	0
9		POPULATION - 1 MILE		30
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	50
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**





SUMMARY OF WATER QUALITY ANALYSES  
IHHM01 - Noranda New World - Nor MA Permit

Page: 49  
02/10/92

Sample Type: Surface Water

SITE CODE LLC-1  
SAMPLE DATE 07/09/91  
LAB CHEN  
LAB NUMBER 117571  
SAMPLE NUMBER MMW-9107-107  
MMW-9108-301  
MMW-9109-100

SBC-1  
08/13/91  
CHEN  
118925  
MMW-9108-306  
MMW-9109-116

SBC-2  
08/13/91  
CHEN  
118924  
MMW-9108-305  
MMW-9109-117

SBC-3  
08/13/91  
CHEN  
118926  
MMW-9108-307  
MMW-9109-118

-- PHYSICAL PARAMETERS --

EH (MILLIVOLTS) (FLD)	-026	-098	-089	-068	-105.0	-109.0	-109.0
FLOW (cfs)	20.5	1.2	0.7	1.5	2.9	1.1	0.5
OXYGEN (O) (FLD)	5.6	8.64	8.88	8.45	8.91	9.07	8.0
PHI (FLD)	8.27	7.6	7.1	8.1	8.1	8.2	8.0
SC (UMHOS/CM @ 25 C) (FLD)	24.0	42.6	44.0	225.0	249.0	231.0	232.0
SC (UMHOS/CM @ 25 C)	25.0	38.0	40.0	240.0	263.0	233.0	126.0
TDS (@ 180 C)	27.0	15.0	35.0	126.0	149.0	124.0	6.0
TOTAL SUSPENDED SOLIDS	<2.0	<2.0	4.0	<4.0	3.0	<2.0	0.24
TURBIDITY	0.45	0.3	0.74	0.24	1.0	0.3	0.24
WATER TEMPERATURE (FLD)	10.5	9.0	6.0	6.0	10.5	7.1	0.24

-- COMMON IONS --

TOTAL HARDNESS AS CaCO3	<12.0	17.0	23.0	136.0	143.0	129.0	131.0
CALCIUM (CA) (DIS)	3.0	5.0	6.0	41.0	44.0	40.0	39.0
MAGNESIUM (MG) (DIS)	<1.0	1.0	2.0	8.0	8.0	7.0	8.0
SODIUM (NA) (DIS)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
POTASSIUM (K) (DIS)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TOTAL ALKALINITY AS CaCO3	13.0	16.0	20.0	118.0	107.0	107.0	120.0
BICARBONATE (HCO3)	16.0	20.0	20.0	144.0	130.0	130.0	147.0
CARBONATE AS CO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SULFATE (SO4)	2.0	5.0	5.0	5.0	20.0	3.0	3.0
CHLORIDE (CL)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HYDROXIDE (OH)			0.0	0.0	0.0	0.0	0.0

-- NUTRIENTS --

AMMONIA (NH3 AS N)	<0.05	<0.05	0.05 J2, UJ1	0.11 J2, UJ1	0.05	0.07 J2, UJ1	0.05 0.15 J4, J2, UJ1
KJELDAHL NITROGEN AS N	0.21	<0.2	0.23	0.23	0.23	0.2	<0.2
NITRATE + NITRITE AS N	<0.05	<0.05	<0.05	0.23	0.12	0.16	0.24
ORTHO-PHOSPHATE (PO4-P)	<0.02	<0.02	<0.02 UJ1	<0.02 UJ1	<0.02	<0.02 UJ1	<0.02 UJ1
PHOSPHORUS (P) *TOT	<0.02	<0.02	0.03 UJ1	0.02 UJ1	<0.02	0.02 UJ1	<0.02 UJ1

-- TRACE ELEMENTS --

ALUMINUM (AL) *DIS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
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- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
Blank line indicates parameter not tested.

Source: Crown Butte Hard Rock Permit Application

Dung Road  
Sole Butte  
Creek

Upgraded Soda  
Butte Creek

Sample Type: Surface Water

SITE CODE	LLC-1	LLC-1	LLC-1	SBC-1	SBC-1	SBC-2	SBC-2	SBC-3	SBC-3
SAMPLE DATE	07/09/91	08/13/91	09/24/91	08/13/91	09/24/91	08/13/91	09/24/91	00/13/91	09/24/91
LAB	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN
LAB NUMBER	117571	118920	120346	118925	120319	118924	120320	118926	120321
SAMPLE NUMBER	NW-9107-107	NW-9108-301	NW-9109-108	NW-9108-306	NW-9109-116	NW-9108-305	NW-9109-117	NW-9108-307	NW-9109-118
ALUMINUM (AL) *TRC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
ANTIMONY (SB) *DIS			<0.05	<0.05	<0.05		<0.05		<0.05
ANTIMONY (SB) *TRC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05
ARSENIC (AS) *DIS			<0.005	<0.005	<0.005		<0.005		<0.005
ARSENIC (AS) *TRC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BARIUM (BA) *DIS			<0.1	<0.1	<0.1		<0.1		<0.1
BARIUM (BA) *TRC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BERYLLIUM (BE) *DIS			<0.005	<0.005	<0.005		<0.005		<0.005
BERYLLIUM (BE) *TRC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
CADMIUM (CD) *DIS			<0.0001	<0.0001	<0.0001		<0.0001		<0.0001
CADMIUM (CD) *TRC	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	0.0002	<0.0001	0.0003
CHROMIUM (CR) *DIS			<0.02	<0.02	<0.02		<0.02		<0.02
CHROMIUM (CR) *TRC	<0.02	<0.02	<0.02	0.02	<0.02	0.02	<0.02	<0.02	<0.02
COPPER (CU) *DIS			<0.001	<0.001	0.002		0.002		0.002
COPPER (CU) *TRC	0.004	0.002	0.004 UJ1	<0.001	0.002 UJ1	0.006	0.009 UJ1	0.002	0.002 UJ1
IRON (FE) *DIS			0.04		<0.03		<0.03		<0.03
IRON (FE) *TRC	0.06	<0.03	0.04	0.03	<0.03	0.46	1.92	0.07	<0.03
LEAD (PB) *DIS			<0.002	<0.002	<0.002		<0.002		<0.002
LEAD (PB) *TRC	<0.002 J2	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.002	0.003
MANGANESE (MN) *DIS			<0.02	<0.02	<0.02		0.08		<0.02
MANGANESE (MN) *TRC	<0.02	<0.02	<0.02	<0.02	<0.02	0.09	0.1	<0.02	<0.02
MERCURY (HG) *DIS			<0.0001 J2	<0.0001 J2	<0.0001 J2		<0.0001 J2		0.0001 J2
MERCURY (HG) *TRC	<0.0001 J2	0.0003	<0.0001 J2	0.0003	<0.0001 J2	0.0002	<0.0001 J2	0.0002	<0.0001 J2
MOLYBDENUM (MO) *DIS			<0.005	<0.005	<0.005		<0.005		<0.005
MOLYBDENUM (MO) *TRC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005
NICKEL (NI) *DIS			<0.02	<0.02	<0.02		<0.02		<0.02
NICKEL (NI) *TRC	<0.03	<0.03	<0.02	<0.03	<0.02	<0.03	<0.02	<0.03	<0.02
SELENIUM (SE) *DIS			<0.005	<0.005	<0.005		<0.005		<0.005
SELENIUM (SE) *TRC	<0.005 J2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SILVER (AG) *DIS			0.0013 UJ1	<0.0005 UJ1	<0.0005 UJ1		<0.0005 UJ1		<0.0005 UJ1
SILVER (AG) *TRC	<0.0005	<0.0005	0.0019 UJ1	<0.0005	0.0006 UJ1	<0.0005	0.0023 UJ1	<0.0005	<0.0005 J4, UJ1
THALLIUM (TL) *DIS			<0.1	<0.1	<0.1		<0.1		<0.1
THALLIUM (TL) *TRC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

\* DIS - Dissolved  
 \* FRE - Free  
 \* TOT - Total  
 \* TRC - Total Recoverable  
 \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
 Blank line indicates parameter not tested.



Sample Type: Surface Water

SITE CODE	LLC-1	LLC-1	LLC-1	SBC-1	SBC-1	SBC-2	SBC-2	SBC-3	SBC-3
SAMPLE DATE	07/09/91	08/13/91	09/24/91	08/13/91	09/24/91	08/13/91	09/24/91	08/13/91	09/24/91
LAB	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN
LAB NUMBER	117571	118920	120346	118925	120319	118924	120320	118926	120321
SAMPLE NUMBER	NNA-9107-107	NNA-9108-301	NNA-9109-108	NNA-9108-306	NNA-9109-116	NNA-9108-305	NNA-9109-117	NNA-9108-307	NNA-9109-118

-- TRACE ELEMENTS --

ZINC (ZN) *DIS									
ZINC (ZN) *TRC	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.06	<0.01

-- OTHER PARAMETERS --

CYANIDE (CN) *TOT	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
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- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAD - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
 Blank line indicates parameter not tested.

Statistical Summary  
Site: SBC-1

Site: SUC-1		Historical Data Range:		Mean	Standard Deviation	Median	Samples N NLT	t-TEST for Mean 99% Confidence Interval
	Result	Date						
PHYSICAL PARAMETERS								
FLOW (CFS)	1.50000-13.00000	1989-91	6.51800	4.81837	5.33000	5	0	0.00000-16.43889
OXYGEN (O) (field)	9.30000-9.80000	1990-91	9.55000			2	0	
PH (field)	6.67000-8.62000	1989-91	7.12233	0.88372	7.50000	5	0	5.30270-8.94188
PH	7.90000-8.30000	1989-91	8.11351	0.16733	8.10000	5	0	7.76898-8.45804
SC (UMHOS/CM @ 25 C) (field)	198.00000-233.00000	1990-91	219.47500	15.06107	223.45000	4	0	175.48915-263.46085
SC (UMHOS/CM @ 25 C)	218.00000-250.00000	1989-91	239.80000	12.93058	242.00000	5	0	213.17631-266.42369
TDS - CALCULATED	<135.00000	1990				1	1	
IDS (@ 180 C)	126.00000-148.00000	1989-91	139.60000	10.69112	147.00000	5	0	117.58729-161.61271
TOTAL SUSPENDED SOLIDS	<1.00000-5.00000	1990-91	2.62500	1.88746	3.50000	4	2	0.00000-8.13733
TURBIDITY	0.24000-0.47000	1990-91	0.33750	0.09743	0.32000	4	0	0.05296-0.62704
WATER TEMPERATURE (field)	2.80000-7.50000	1989-91	5.76000	1.75585	6.20000	5	0	2.14476-9.37524
COMMON IONS								
TOTAL HARDNESS AS CaCO3	129.00000-136.00000	1990-91	132.00000	3.60555	131.00000	3	0	111.33947-152.66053
CALCIUM (CA) (DIS)	40.00000-41.00000	1990-91	40.33333	0.57735	40.00000	3	0	37.02500-43.64166
MAGNESIUM (MG) (DIS)	7.00000-8.00000	1990-91	7.33333	0.57735	7.00000	3	0	4.02500-10.64166
SODIUM (NA) (DIS)	<1.00000-2.00000	1990-91	1.00000	0.86603	1.00000	3	2	0.00000-5.96253
POTASSIUM (K) (DIS)	<1.00000	1991				2	2	
TOTAL ALKALINITY AS CaCO3	107.00000-126.00000	1989-91	118.00000	8.04756	119.50000	4	0	94.51462-141.48538
BICARBONATE (HCO3)	144.00000-148.00000	1990-91	146.00000			2	0	
CARBONATE AS CO3	0.00000	1990-91				2	0	
SULFATE (SO4)	5.00000-11.00000	1989-91	8.60000	2.88097	10.00000	5	0	2.66817-14.53183
CHLORIDE (CL)	<1.00000	1990-91				3	3	
HYDROXIDE (OH)	0.00000	1991				1	0	
NUTRIENTS								
AMMONIA (NH3 AS N)	<0.05000-0.11000	1990-91	<0.08667			3	3	
KJELDAHL NITROGEN AS N	<0.10000-0.23000	1990-91	0.15000	0.09721	0.20000	3	2	0.00000-0.70703
NITRATE + NITRITE AS N	0.15000-0.34000	1990-91	0.24000	0.09539	0.23000	3	0	0.00000-0.78660
ORTHO-PHOSPHATE (PO4-P)	<0.01000-0.02000	1990-91	<0.01667			3	3	
PHOSPHORUS (P) (TOT)	<0.01000-0.02000	1990-91	<0.01667			3	3	
CATION AND ANION BALANCE								
STGMA	0.29000	1990				1	0	
TRACE ELEMENTS								
ALUMINUM (AL) (DIS)	<0.10000	1990-91				2	2	
ALUMINUM (AL) (TRC)	<0.10000	1990-91				4	4	
ANTIMONY (SB) (DIS)	<0.05000	1991				1	1	
ANTIMONY (SB) (TRC)	<0.05000	1991				2	2	
ARSENIC (AS) (DIS)	<0.00500	1990-91				2	2	
ARSENIC (AS) (TRC)	<0.00500	1989-91				5	5	
BARIUM (BA) (DIS)	<0.10000	1990-91				2	2	
BARIUM (BA) (TRC)	<0.10000	1990-91				3	3	
BERYLLIUM (BE) (DIS)	<0.00500	1991				1	1	
BERYLLIUM (BE) (TRC)	<0.00500	1991				2	2	
CADMIUM (CD) (DIS)	<0.00010	1990-91				2	2	
CADMIUM (CD) (TRC)	<0.00010-0.00100	1989-91	0.00020			5	4	
CHROMIUM (CR) (DIS)	<0.02000	1990-91				2	2	
CHROMIUM (CR) (TRC)	<0.02000	1990-91				3	2	
COPPER (DIS)	<0.00100-0.00200	1990-91	0.00150			2	1	
COPPER (TRC)	<0.00100-0.01000	1989-91	<0.0048			5	5	
IRON (FE) (DIS)	<0.03000	1990-91				2	2	
IRON (FE) (TRC)	<0.03000-0.11000	1989-91	0.04396	0.03851	0.03000	5	1	0.00000-0.12325
LEAD (PBL) (DIS)	<0.00200	1990-91				2	2	

Statistical Summary  
Site: SBC-1

Statistical Summary									
Site: SBC-1									
Historical Data Range:									
Result		Date		Mean	Standard Deviation	Median	Number of Samples		t-TEST for Mean 99% Confidence Interval
							N	NLT	
TRACE ELEMENTS									
LEAD (PB) (TRC)		<0.00200	1990-91				3	3	
MANGANESE (MN) (DIS)		<0.02000	1990-91				2	2	
MANGANESE (MN) (TRC)		<0.02000	1989-91				5	5	
MERCURY (HG) (DIS)		<0.00010	1990-91				2	2	
MERCURY (HG) (TRC)		<0.00010-0.00030	1990-91	0.00013	0.00014	0.00010	3	2	0.00000-0.00093
MOLYBDENUM (MO) (DIS)		<0.00500	1990-91				2	2	
MOLYBDENUM (MO) (TRC)		<0.00500	1990-91				3	3	
NICKEL (NI) (DIS)		<0.02000	1991				1	1	
NICKEL (NI) (TRC)		<0.02000-0.03000	1991	<0.02500			2	2	
SELENIUM (SE) (DIS)		<0.00500	1990-91				2	2	
SELENIUM (SE) (TRC)		<0.00500	1990-91				3	3	
SILVER (AG) (DIS)		<0.00050	1990-91				2	2	
SILVER (AG) (TRC)		<0.00050-0.00060	1990-91	<0.00053			3	3	
THALLIUM (TL) (DIS)		<0.10000	1991				1	1	
THALLIUM (TL) (TRC)		<0.10000	1991				2	2	
ZINC (ZN) (DIS)		<0.01000-0.03000	1990-91	0.02000			2	1	
ZINC (ZN) (TRC)		<0.01000-0.03000	1989-91	0.01877	0.00753	0.02000	5	2	0.00327-0.03427
OTHER PARAMETERS									
CYANIDE (CN) (TOT)		<0.00500	1990-91				3	3	

All quantities in mg/L unless otherwise noted. N - sample population (including detection limit data); NLT - number of below detection limit results. Robust log-probability regression used for mean and standard deviation estimate, adjusted lognormal maximum likelihood used for median for data with detection limit results (USGS multiple detection limit algorithm). No statistics computed if 90% of data below detection limit.



Statistical Summary  
Site: SBC-2

t-TEST for Mean  
99% Confidence Interval

Number of  
Samples  
N NLT

Standard  
Deviation

Median

Mean

Historical Data Range:  
Result Date

PHYSICAL PARAMETERS

FLOW (CFS)	0.02000-2.90000	1990-91	1.47333	1.50000	3	0	0.00000-9.72591
OXYGEN (O)	8.60000	1990			1	0	
PH (field)	6.77000-8.91000	1990-91	7.84000		2	0	
PH	8.10000-8.20000	1990-91	8.15000	8.10000	3	0	0.00000-65.21184
SC (UMHOS/CM @ 25 C) (field)	248.00000-249.00000	1990-91	248.50000		2	0	
SC (UMHOS/CM @ 25 C)	250.00000-276.00000	1990-91	263.00000	263.00000	3	0	188.50738-337.49262
TDS - CALCULATED	134.00000	1990			1	0	
TDS (at 180 C)	138.00000-151.00000	1990-91	146.00000	149.00000	3	0	105.88859-186.11141
TOTAL SUSPENDED SOLIDS	3.00000-4.00000	1990-91	3.66667	4.00000	3	0	0.35834-6.97500
TURBIDITY	0.99000-2.30000	1990-91	1.43000	1.00000	3	0	0.00000-5.74748
WATER TEMPERATURE (field)	10.50000-12.50000	1990-91	11.50000		2	0	

COMMON IONS

TOTAL HARDNESS AS CaCO3	132.00000-143.00000	1990-91	137.66667	138.00000	3	0	106.10721-169.22619
CALCIUM (CA) (DIS)	37.00000-44.00000	1990-91	41.00000	42.00000	3	0	20.33947-61.66053
MAGNESIUM (MG) (DIS)	8.00000-10.00000	1990-91	8.66667	8.00000	3	0	2.05001-15.28553
SODIUM (NA) (DIS)	<1.00000	1990-91			3	2	
POTASSIUM (K) (DIS)	<1.00000	1991			2	2	
TOTAL ALKALINITY AS CaCO3	101.00000-107.00000	1990-91	106.00000		2	0	
BICARBONATE (HCO3)	123.00000-130.00000	1990-91	126.50000		2	0	
CARBONATE AS CO3	0.00000	1990-91			2	0	
SULFATE (SO4)	20.00000-23.00000	1990-91	21.00000	20.00000	3	0	11.07500-30.92500
CHLORIDE (CL)	<1.00000	1990-91			3	3	
HYDROXIDE (OH)	0.00000	1991			1	0	

NUTRIENTS

AMMONIA (NH3 AS N)	<0.05000-0.10000	1990-91	0.06000		3	1	
KJELDAHL NITROGEN AS N	<0.10000-0.23000	1990-91	0.16000	0.09664	3	1	0.00000-0.71262
NITRATE + NITRITE AS N	0.12000-0.19000	1990-91	0.15667	0.03512	3	0	0.00000-0.35791
ORTHO-PHOSPHATE (PO4-P)	<0.01000-0.02000	1990-91	<0.01667		3	3	
PHOSPHORUS (P) (TOT)	<0.01000-0.02000	1990-91	0.01500	0.00866	3	2	0.00000-0.06462

CATION AND ANION BALANCE

SIGMA	1.60000	1990			1	0	
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TRACE ELEMENTS

ALUMINUM (AL) (DIS)	<0.10000	1990-91			2	2	
ALUMINUM (AL) (TRC)	<0.10000	1990-91			3	2	
ANTIMONY (SB) (DIS)	<0.05000	1991			1	1	
ANTIMONY (SB) (TRC)	<0.05000-0.07000	1991	0.06000		2	1	
ARSENIC (AS) (DIS)	<0.00500	1990-91			2	2	
ARSENIC (AS) (TRC)	<0.00500	1990-91			3	3	
BARIUM (BA) (DIS)	<0.10000	1990-91			2	2	
BARIUM (BA) (TRC)	<0.10000	1990-91			3	3	
BERYLLIUM (BE) (DIS)	<0.00500	1991			1	1	
BERYLLIUM (BE) (TRC)	<0.00500	1991			2	2	
CADMIUM (CD) (DIS)	<0.00010	1990-91			2	2	
CADMIUM (CD) (TRC)	<0.00010-0.00020	1990-91	0.00010	0.00010	3	2	0.00000-0.00062
CHROMIUM (CR) (DIS)	<0.02000	1990-91			2	2	
CHROMIUM (CR) (TRC)	<0.02000	1990-91			3	2	
COPPER (CU) (DIS)	0.00100-0.00200	1990-91	0.00150		2	0	
COPPER (CU) (TRC)	0.00200-0.00900	1990-91	0.00567	0.00351	3	0	0.00000-0.02578
COPPER (CU) (TRC)	<0.03000-0.13000	1990-91	0.08000		2	1	
IRON (DIS)	0.46000-1.92000	1990-91	1.05	0.76742	3	0	0.00000-5.45080
IRON (TRC)	<0.00200	1990-91			2	2	
LEAD (PB) (DIS)							

All quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); HLT = number of below detection limit results. All quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); HLT = number of below detection limit results. All quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); HLT = number of below detection limit results.

Statistical Summary  
Site: SBC-2

Site: SBC-2

	Historical Data Range:		Mean	Standard Deviation	Median	Samples		t-TEST for Mean 99% Confidence Interval
	Result	Date				H	NLT	
TRACE ELEMENTS								
LEAD (PB) (TRC)	<0.00200	1990-91				3	2	
MANGANESE (MN) (DIS)	0.03000-0.08000	1990-91	0.05500			2	0	
MANGANESE (MN) (TRC)	0.03000-0.10000	1990-91	0.07333	0.03786	0.07000	3	0	0.00000-0.29028
MERCURY (HG) (DIS)	<0.00010	1990-91				2	2	
MERCURY (HG) (TRC)	<0.00010-0.00020	1990-91	0.00010	0.00009	0.00010	3	2	0.00000-0.00062
MOLYBDENUM (MO) (DIS)	<0.00500	1990-91				2	2	
MOLYBDENUM (MO) (TRC)	<0.00500	1990-91				3	3	
NICKEL (NI) (DIS)	<0.02000	1991	<0.02500			1	1	
NICKEL (NI) (TRC)	<0.02000-0.03000	1991				2	2	
SELENIUM (SE) (DIS)	<0.00500	1990-91				2	2	
SELENIUM (SE) (TRC)	<0.00500	1990-91				3	3	
SILVER (AG) (DIS)	<0.00050	1990-91				2	2	
SILVER (AG) (TRC)	<0.00050-0.00230	1990-91	0.00093	0.00118	0.00050	3	2	0.00000-0.00769
THALLIUM (TL) (DIS)	<0.10000	1991				1	1	
THALLIUM (TL) (TRC)	<0.10000	1991				2	2	
ZINC (ZN) (DIS)	<0.01000-0.02000	1990-91	0.01500			2	1	
ZINC (ZN) (TRC)	0.02000-0.03000	1990-91	0.02333	0.00577	0.02000	3	0	0.00000-0.05639
OTHER PARAMETERS								
CYANIDE (CN) (TOT)	<0.00500	1990-91				3	3	

All quantities in mg/L unless otherwise noted. N - sample population (including detection limit data); NLT - number of below detection limit results. Robust log-probability regression used for mean and standard deviation estimate, adjusted lognormal maximum likelihood used for median for data with below detection limit results (USGS multiple detection limit algorithm). No statistics computed if 90% of data below detection limit.

MacClean Testings

Miller Creek @ Sula  
confluence of Sula  
Bottle CK.

SUMMARY OF WATER QUALITY ANALYSES  
NMAJ01 - Noranda New World - Nor MA Permit

Sample Type: Surface Water

SITE CODE	SW-3	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-5	SW-5
SAMPLE DATE	09/24/91	03/15/91	06/05/91	06/05/91	07/09/91	08/14/91	08/14/91	08/14/91	06/05/91	07/09/91
LAB	CHEN	EL	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN
LAB NUMBER	120340	91-10197	116353	116275	117568	118912	118913	120343	116352	117592
REMARKS				Duplicate			Duplicate			
SAMPLE NUMBER	NMAJ-9109-102	NMAJ-9103-100	NMAJ-9106-103	NMAJ-9106-104	NMAJ-9107-104	NMAJ-9108-311	NMAJ-9108-312	NMAJ-9109-105	NMAJ-9106-111	NMAJ-9107-110

-- PHYSICAL PARAMETERS --										
EH (MILLIVOLTS) (FLD)	+193		-026	-026	-034	+030	+030	+008	-038	-78.4
FLOW (cfs)	0.2		55.3	55.3	21.0	1.7	1.7	1.1	50.6	11.1
OXYGEN (O) (FLD)	8.35		10.6	10.6	14.1	6.9	6.9	8.9	9.3	7.2
PH (FLD)	3.29		7.07	7.07	6.72	6.25	6.25	6.66	7.64	8.37
PH	3.5		6.9	6.9	6.7	6.3	6.4	6.5	6.7	6.8
SC (UMHOS/CM @ 25 C) (FLD)	396.0		64.0	64.0	87.0	122.0	122.0	124.0	95.0	124.0
SC (UMHOS/CM @ 25 C)	364.0		74.0	75.0	92.0	136.0	135.0	141.0	104.0	123.0
STAFF GAGE (ft)			1.30/1.7L	1.30/1.7L	0.90/1.1L	3.40/.68L	3.40/.68L		1.8	1.41
TDS (@ 180 C)	237.0		41.0	42.0	76.0	83.0	97.0	100.0	54.0	75.0
TOTAL SUSPENDED SOLIDS	39.0		<10.0	<10.0	4.0	3.0	3.0	<3.0	76.0	4.0
TURBIDITY	17.2		3.3 J4	4.4	1.7	1.1	1.3	1.11	4.0	0.35
WATER TEMPERATURE (FLD)	4.1		2.0	2.0	10.0	15.3	15.3	7.5	2.5	13.4
-- COMMON IONS --										
TOTAL HARDNESS AS CaCO3	82.0		27.0	28.0	41.0	54.0	54.0	57.0	50.0	54.0
CALCIUM (CA) (DIS)	21.0		7.9	8.0	13.0	15.0	15.0	16.0	15.8	20.0
MAGNESIUM (MG) (DIS)	7.0		1.8	1.8	2.0	4.0	4.0	4.0	2.5	1.0
SODIUM (NA) (DIS)	2.0		0.8	0.6	<1.0	2.0	2.0	<1.0	0.5	1.0
POTASSIUM (K) (DIS)	2.0		0.4	0.4	<1.0	<1.0	<1.0	<1.0	0.6	<1.0
TOTAL ALKALINITY AS CaCO3	<1.0		11.0	11.0	9.0			6.0	36.0	47.0
ACIDITY AS CaCO3	48.0									
BICARBONATE (HCO3)	<1.0		13.0	13.0	11.0			8.0	44.0	57.0
CARBONATE AS CO3	0.0		0.0	0.0	0.0			0.0	0.0	0.0
SULFATE (SO4)	135.0		18.0	17.0	26.0	50.0	51.0	49.0	10.0	11.0
CHLORIDE (CL)	<1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HYDROXIDE (OH)	0.0									
-- NUTRIENTS --										
AMMONIA (NH3 AS N)	0.05 J2,UJ1		0.06	0.05	<0.05	<0.05	<0.05	0.08 J2,UJ1	0.06	0.09
KJELDAHL NITROGEN AS N	0.2		0.2	<0.2	0.22	<0.2	<0.2	0.22	0.52	0.21
NITRATE + NITRITE AS N	0.06		<0.05	<0.05	<0.05	0.32	<0.05	0.07	0.2	<0.05
ORTHO-PHOSPHATE (PO4-P)	0.1 UJ1		<0.01	<0.02	<0.02	<0.02	<0.02	<0.02 UJ1	0.08	<0.02

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
Blank line indicates parameter not tested.



Sample Type: Surface Water

SITE CODE	SW-3	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-5	SW-5
SAMPLE DATE	09/24/91	03/15/91	06/05/91	06/05/91	07/09/91	08/14/91	08/14/91	08/14/91	06/05/91	06/05/91
LAB	CHEN	EL	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN
LAB NUMBER	120340	91-10197	116353	116275	117568	118912	118913	120343	116352	116352
REMARKS				Duplicate			DUPLICATE			
SAMPLE NUMBER	NMA-9109-102	NMA-9103-100	NMA-9106-103	NMA-9106-104	NMA-9107-104	NMA-9108-311	NMA-9108-312	NMA-9109-105	NMA-9106-111	NMA-9106-111
-- NUTRIENTS --										
PHOSPHORUS (P) *TOT	0.09 U/L	0.12	<0.02	<0.02	0.02	<0.02	<0.02	0.06 U/L	0.15	<0.02
-- TRACE ELEMENTS --										
ALUMINUM (AL) *DIS	4.0	<0.1	<0.2	0.1	<0.1	0.4	0.4	<0.1	1.8	<0.1
ALUMINUM (AL) *TRC	4.3									
ANTIMONY (SB) *DIS	<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ANTIMONY (SB) *TRC	<0.05									
ARSENIC (AS) *DIS	<0.005	<0.005	<0.001	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
ARSENIC (AS) *TRC	<0.005									
BARIUM (BA) *DIS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BARIUM (BA) *TRC	<0.1									
BERYLLIUM (BE) *DIS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BERYLLIUM (BE) *TRC	<0.005									
CADMIUM (CD) *DIS	0.0008	0.001	<0.001	<0.001	0.0002	0.0002	0.0002	0.0006	0.0004	<0.0001
CADMIUM (CD) *TRC	0.0022									
CHROMIUM (CR) *DIS	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
CHROMIUM (CR) *TRC	<0.02									
COPPER (CU) *DIS	0.93	0.06	0.05 U/L	0.06 U/L	0.1	0.15	0.15	0.11	0.09 U/L	0.021
COPPER (CU) *TRC	0.95									
IRON (FE) *DIS	5.19	<0.03	<0.67	0.61	0.38	0.21	0.2	0.24	3.12	0.06
IRON (FE) *TRC	5.51									
LEAD (PB) *DIS	0.005	<0.01	<0.002	0.002	<0.002 J2	<0.002	<0.002	<0.002	0.003	<0.002 J2
LEAD (PB) *TRC	0.006									
MANGANESE (MN) *DIS	1.26	<0.02	<0.03	0.03	0.05	0.12	0.12	0.08	0.11	<0.02
MANGANESE (MN) *TRC	1.26									
MERCURY (HG) *DIS	<0.0001 J2	<0.001	<0.0001	<0.0001	<0.0001 J2	0.0001	<0.0001	<0.0001 J2	<0.0001	<0.0001 J2
MERCURY (HG) *TRC	<0.0001 J2									
MOLYBDENUM (MO) *DIS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MOLYBDENUM (MO) *TRC	<0.005									
NICKEL (NI) *DIS	<0.02	<0.005	<0.02	<0.02	<0.03	<0.03	<0.03	<0.02	<0.02	<0.03
NICKEL (NI) *TRC	<0.02									
SELENIUM (SE) *DIS	<0.005									

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
 Blank line indicates parameter not tested.

SUMMARY WATER QUALITY ANALYSES  
199401 - Noranda New World - Nor NM Perit

Sample Type: Surface Water

SITE CODE	SW-3	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-4L/4U	SW-5	SW-5
SAMPLE DATE	09/24/91	06/05/91	06/05/91	07/09/91	08/14/91	08/14/91	08/14/91	09/24/91	09/24/91	06/05/91	07/09/91
LAB	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN
LAB NUMBER	120340	116353	116275	117568	118912	118913	120343	116352	117592	116352	117592
REMARKS		Duplicate	Duplicate			DUPLICATE					
SAMPLE NUMBER	NNW-9109-102	NNW-9106-103	NNW-9106-104	NNW-9107-104	NNW-9108-311	NNW-9108-312	NNW-9109-105	NNW-9106-111	NNW-9107-110		

-- TRACE ELEMENTS --

SELENIUM (SE) *TRC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
SILVER (AG) *DIS	<0.0005 UJ1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
SILVER (AG) *TRC	0.0011 UJ1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
THALLIUM (TL) *DIS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
THALLIUM (TL) *TRC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
ZINC (ZN) *DIS	0.16	<0.01	<0.01	0.03	0.07	0.07	0.05	0.01	0.02	0.01	0.02
ZINC (ZN) *TRC	0.16	<0.01	<0.01	0.03	0.07	0.07	0.04	0.01	0.02	0.01	0.02

-- OTHER PARAMETERS --

CYANIDE (CN) *TOT	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
-------------------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
Blank line indicates parameter not tested.

SUMMARY OF WATER QUALITY ANALYSES  
HMA01 - Noranda New World - Nor NM Permit

Sample Type: Surface Water

SITE CODE	SW-5	SW-5	SW-5	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6
SAMPLE DATE	08/13/91	08/13/91	08/13/91	09/24/91	03/15/91	06/05/91	07/09/91	08/14/91	09/24/91	11/05/91
LAB	CHEN	CHEN	CHEN	CHEN	EL	CHEN	CHEN	CHEN	CHEN	CHEN
LAB NUMBER	118934	118935	118935	120318	91-10201	116276	117569	118914	120344	
REMARKS	DUPLICATE									
SAMPLE NUMBER	NMA-9108-355	NMA-9108-356	NMA-9109-115		NMA-9103-104	NMA-9106-105	NMA-9107-105	NMA-9108-313	NMA-9109-106	NMA-9111-909
										NMA-9112-916
-- PHYSICAL PARAMETERS --										
EH (MILLIVOLTS) (FLD)	-079	-079	-068		-011	-016	-031	-029	+006	
FLOW (cfs)	0.7	0.7	0.5		1.0	201.7	51.2	3.9	2.3	2.7
OXYGEN (O) (FLD)	8.2	8.2	9.1		14.4	10.0	7.5	7.1	7.9	
PH (FLD)	8.27	8.27	8.41		8.01	6.67	6.72	7.31	6.71	
PH	8.1	8.2	8.1		6.8	7.0	7.1	7.3	7.0	
SC (UMHOS/CM @ 25 C) (FLD)	152.0	152.0	180.0		66.0	35.0	62.0	94.1	85.0	
SC (UMHOS/CM @ 25 C)	186.0	180.0	193.0		71.0	42.0	55.0	89.0	92.0	
STAFF GAGE (ft)	0.97	0.97			0.38	2.2	1.25	.52		.51
TDS (@ 180 C)	101.0	107.0	105.0		45.0	16.0	46.0	61.0	70.0	
TOTAL SUSPENDED SOLIDS	<2.0	<2.0	<4.0		<10.0	<10.0	2.0	<2.0	<3.0	
TURBIDITY	0.3	0.3	0.37		1.5	1.5	0.9	0.3	0.47	
WATER TEMPERATURE (FLD)	13.0	9.6	7.0		1.1	2.0	12.0	13.3	9.0	
-- COMMON IONS --										
TOTAL HARDNESS AS CaCO3	89.0	89.0	91.0		31.0	16.0	27.0	43.0	43.0	
CALCIUM (CA) (DIS)	29.0	29.0	30.0		9.0	4.4	9.0	12.0	12.0	
MAGNESIUM (MG) (DIS)	4.0	4.0	4.0		2.0	1.1	1.0	3.0	3.0	
SODIUM (NA) (DIS)	<1.0	<1.0	<1.0		1.0	0.5	<1.0	1.0	<1.0	
POTASSIUM (K) (DIS)	<1.0	<1.0	<1.0		<1.0	0.3	<1.0	<1.0	<1.0	
TOTAL ALKALINITY AS CaCO3			65.0		22.0	9.0	15.0		21.0	
BICARBONATE (HCO3)			79.0		27.0	11.0	18.0		26.0	
CARBONATE AS CO3			0.0		0.0	0.0	0.0		0.0	
SULFATE (SO4)	18.0	19.0	19.0		13.0	6.0	15.0	21.0	19.0	
CHLORIDE (CL)	<1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0	<1.0	
HYDROXIDE (OH)			0.0						0.0	
-- NUTRIENTS --										
AMMONIA (NH3 AS N)	<0.05	<0.05	<0.05 J2,UJ1		<0.1	0.05	<0.05	0.09	<0.05 J2,UJ1	
KJELDAHL NITROGEN AS N	<0.2	<0.2	0.32		0.4	0.3	<0.2	<0.2	0.27	
NITRATE + NITRITE AS N	0.09	<0.05	0.06		0.13	<0.05	<0.05	<0.05	0.11	
ORTHO-PHOSPHATE (PO4-P)	<0.02	0.02	<0.02 UJ1		<0.01	<0.02	<0.02	<0.02	0.05 UJ1	
PHOSPHORUS (P) *TOT	<0.02	0.02	<0.02 UJ1		0.03	<0.02	<0.02	<0.02	0.05 UJ1	

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAD - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
Blank line indicates parameter not tested.



Statistical Summary  
Site: SW-5

Historical Data Range:  
Result Date

Number of  
Samples  
N MLT

Standard  
Deviation

Mean

Median

t-TEST for Mean  
99% Confidence Interval

PHYSICAL PARAMETERS

FLOW (CFS)	0.44000-100.00000	1989-91	24.37048	27.60436	14.34000	21	0	7.23287-41.50809
OXYGEN (O) (field)	7.20000-11.50000	1990-91	9.19000	1.15988	9.05000	14	0	8.25631-10.12369
PH (field)	6.29000-9.24000	1989-91	7.03605	0.88322	7.81000	13	0	6.28769-7.78441
PH	6.70000-8.20000	1989-91	7.24045	0.49349	7.50000	18	0	6.90336-7.57754
SC (UMHOS/CM @ 25 C) (field)	79.00000-226.00000	1989-91	131.83330	37.98955	123.00000	18	0	105.88396-157.78264
SC (UMHOS/CM @ 25 C)	95.00000-220.00000	1989-91	144.72220	41.67353	130.50000	18	0	116.25646-173.18794
STAFF GAGE (FT)	0.34000-2.20000	1989-91	1.48053	0.55185	1.55000	19	0	1.11617-1.84489
TDS - CALCULATED	51.00000-124.00000	1989-90	99.81334			6	0	
TDS (@ 180 C)	50.00000-129.00000	1989-91	82.27778	25.21159	79.50000	18	0	65.05662-99.49894
TOTAL SUSPENDED SOLIDS	<1.00000-111.00000	1989-91	14.56554	28.72737	2.38606	21	8	0.00000-32.40035
TURBIDITY (field)	0.21000-43.00000	1990	6.24000			13	0	
TURBIDITY	0.19000-38.00000	1989-91	5.53381	10.37297	1.30000	21	0	0.00000-11.97366
WATER TEMPERATURE (field)	2.50000-13.50000	1989-91	8.06667	3.59067	7.00000	18	0	5.61401-10.51933

COMMON IONS

TOTAL HARDNESS AS CaCO3	47.00000-112.00000	1989-91	81.30000	24.63083	83.00000	10	0	55.98590-106.61410
CALCIUM (CA) (DIS)	15.00000-36.00000	1989-91	26.38000	7.79313	26.50000	10	0	18.37069-34.38931
MAGNESIUM (MG) (DIS)	1.00000-5.00000	1989-91	3.65000	1.45392	4.00000	10	0	2.15575-5.14425
SODIUM (NA) (DIS)	<0.50000-2.00000	1989-91	0.79347	0.49750	0.80104	10	5	0.28217-1.30477
POTASSIUM (K) (DIS)	<0.60000-1.00000	1991	0.60000			3	2	
TOTAL ALKALINITY AS CaCO3	34.00000-70.00000	1989-91	50.94444	11.68947	48.00000	18	0	42.95977-58.92911
BICARBONATE (HCO3)	42.00000-86.00000	1989-91	67.60000	17.07630	71.00000	10	0	50.05000-85.15000
CARBONATE AS CO3	0.00000	1989-91				10	0	
SULFATE (SO4)	10.00000-38.00000	1989-91	19.05556	9.08439	16.50000	18	0	12.85033-25.26079
CHLORIDE (CL)	<1.00000-2.00000	1989-91	0.60286	0.58740	0.40163	10	7	0.00000-1.20655
HYDROXIDE (OH)	0.00000	1991				1	0	

NUTRIENTS

AMMONIA (NH3 AS N)	<0.05000-0.10000	1989-91	0.06789	0.01556	0.06255	16	13	0.05643-0.07935
KJELDAHL NITROGEN AS N	<0.10000-0.52000	1989-91	0.15100	0.17151	0.10000	9	4	0.00000-0.34281
NITRATE + NITRITE AS N	<0.05000-0.34000	1989-91	0.08694	0.10288	0.04327	16	9	0.01114-0.16274
ORTHO-PHOSPHATE (PO4-P)	<0.01000-0.08000	1989-91	0.01400	0.02331	0.01000	10	8	0.00000-0.03796
PHOSPHORUS (P) (TOT)	<0.01000-0.15000	1989-91	0.02486	0.04766	0.00761	10	6	0.00000-0.07384

CATION AND ANION BALANCE  
SIGMA

	0.16000-1.60000	1989-90	0.74857	0.49479	0.56000	7	0	0.05531-1.44183
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TRACE ELEMENTS

ALUMINUM (AL) (DIS)	<0.10000	1990-91				2	2	
ALUMINUM (AL) (TRC)	<0.10000-1.80000	1989-91	0.31369	0.59882	0.04849	16	10	0.00000-0.75487
ANTIMONY (SB) (DIS)	0.05000	1991				1	0	
ANTIMONY (SB) (TRC)	<0.05000-0.08000	1990-91	0.05000	0.02460	0.05000	5	4	0.00000-0.10065
ARSENIC (AS) (DIS)	<0.00500	1989-91				2	2	
ARSENIC (AS) (TRC)	<0.00500	1989-91				9	9	
BARIUM (BA) (DIS)	<0.10000	1990-91				2	2	
BARIUM (BA) (TRC)	<0.10000	1990-91				8	8	
BERYLLIUM (BE) (DIS)	<0.00500	1991				1	1	
BERYLLIUM (BE) (TRC)	<0.00500	1990-91				5	5	
CADMIUM (CD) (DIS)	<0.00010	1990-91				2	2	
CADMIUM (CD) (TRC)	<0.00010-0.00100	1989-91	0.00040			10	8	
CHROMIUM (CR) (DIS)	<0.02000	1990-91				2	2	
CHROMIUM (CR) (TRC)	<0.02000	1990-91				8	8	
COPPER (CU) (DIS)	0.00400	1990-91				2	0	
COPPER (CU) (TRC)	<0.00300-0.20000	1989-91	0.02798	0.05890	0.00678	16	8	0.00000-0.07137
IRON (FE) (DIS)	<0.03000-0.08000	1990-91	0.05500			2	1	

All quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); MLT = number of below detection limit results. Robust g-probability regression used for mean and standard deviation estimation. No statistics computed if 90% of data below detection limit.

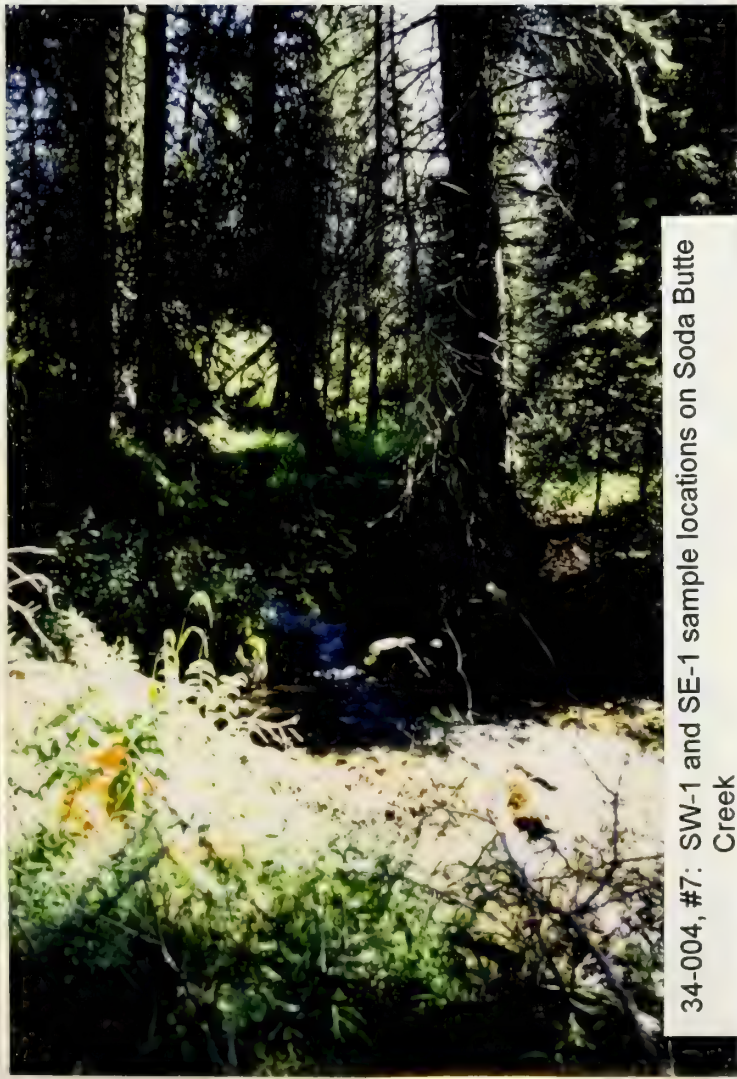
Statistical Summary  
Site: SW-5

Statistical Summary							
Site: SW-5							
	Historical Data Range:		Mean	Standard Deviation	Median	Number of Samples	t-TEST for Mean 99% Confidence Interval
	Result	Date				N NLT	
TRACE ELEMENTS							
IRON (FE) (TRC)	<0.03000-3.22000	1989-91	0.66026	1.22167	0.07500	16 4	0.00000-1.56033
LEAD (PB) (DIS)	<0.00200	1990-91				2 2	
LEAD (PB) (TRC)	<0.00200-0.02200	1989-91	0.00354	0.00658	0.00197	10 6	0.00000-0.01030
MANGANESE (MN) (DIS)	<0.02000	1990-91				2 2	
MANGANESE (MN) (TRC)	<0.02000-0.13000	1989-91	0.03200	0.04662	0.02000	10 8	0.00000-0.07991
MERCURY (HG) (DIS)	<0.00010	1990-91				2 2	
MERCURY (HG) (TRC)	<0.00010-<0.00100	1989-91	<0.00037			10 10	
MOLYBDENUM (MO) (DIS)	<0.00500	1990-91				2 2	
MOLYBDENUM (MO) (TRC)	<0.00500-0.00800	1989-91	0.00500	0.00174	0.00500	10 9	0.00321-0.00679
NICKEL (NI) (DIS)	<0.02000	1991				1 1	
NICKEL (NI) (TRC)	<0.02000-<0.03000	1990-91	<0.02600			5 5	
SELENIUM (SE) (DIS)	<0.00500	1990-91				2 2	
SELENIUM (SE) (TRC)	<0.00500	1989-91				10 10	
SILVER (AG) (DIS)	<0.00050	1990-91				2 2	
SILVER (AG) (TRC)	<0.00050-<0.00500	1989-91	<0.00188			10 10	
THALLIUM (TL) (DIS)	<0.10000	1991				1 1	
THALLIUM (TL) (TRC)	<0.10000	1990-91				5 5	
ZINC (ZN) (DIS)	<0.01000-0.03000	1990-91	0.02000			2 1	
ZINC (ZN) (TRC)	<0.01000-0.46000	1989-91	0.05164	0.11086	0.02000	16 2	0.00000-0.13332
OTHER PARAMETERS							
CYANIDE (CN) (TOT)	<0.00500-<0.01000	1989-91	<0.00700			10 10	
OIL & GREASE	<1.00000	1989				1 1	

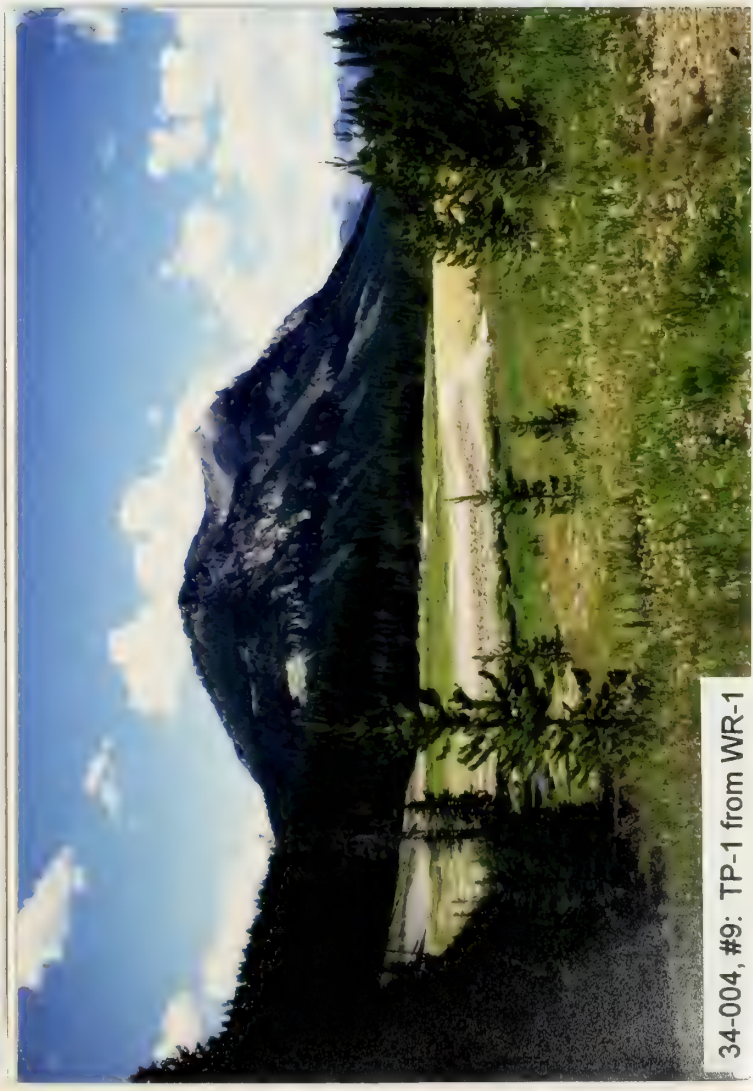
All quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); NLT = number of below detection limit results. Robust log-probability regression used for mean and standard deviation estimates; adjusted lognormal maximum likelihood used for median for data with below detection limit results (USGS multiple detection limit algorithm). Statistics computed if 90% of data below detection limit.



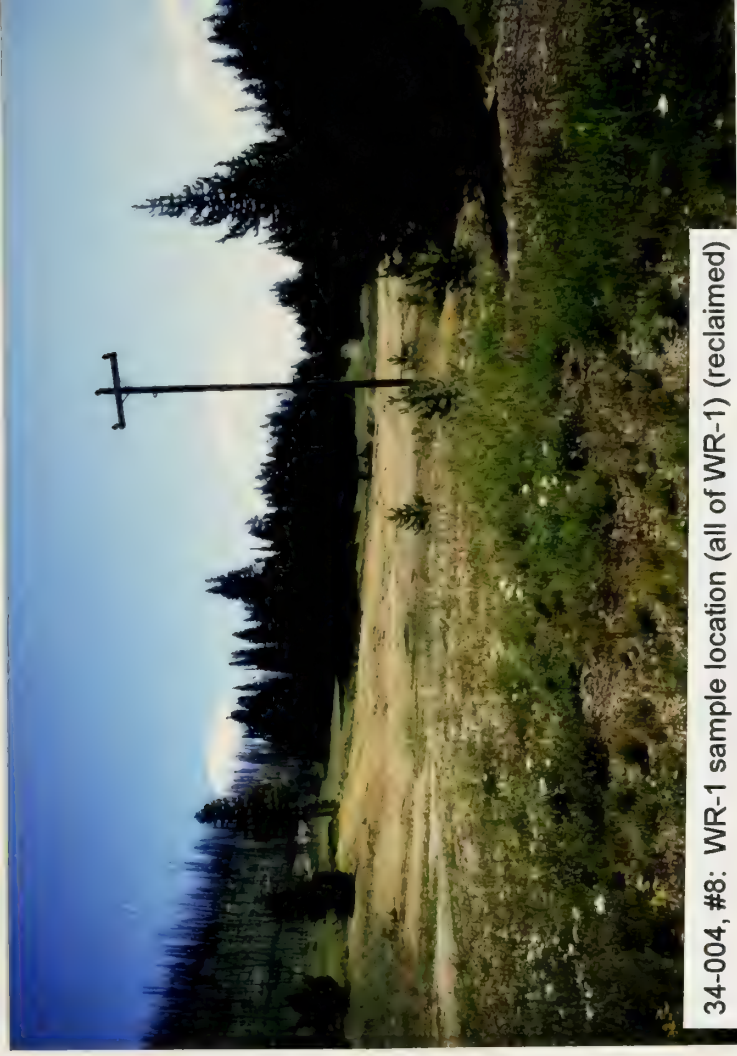




34-004, #7: SW-1 and SE-1 sample locations on Soda Butte Creek



34-004, #9: TP-1 from WR-1



34-004, #8: WR-1 sample location (all of WR-1) (reclaimed)

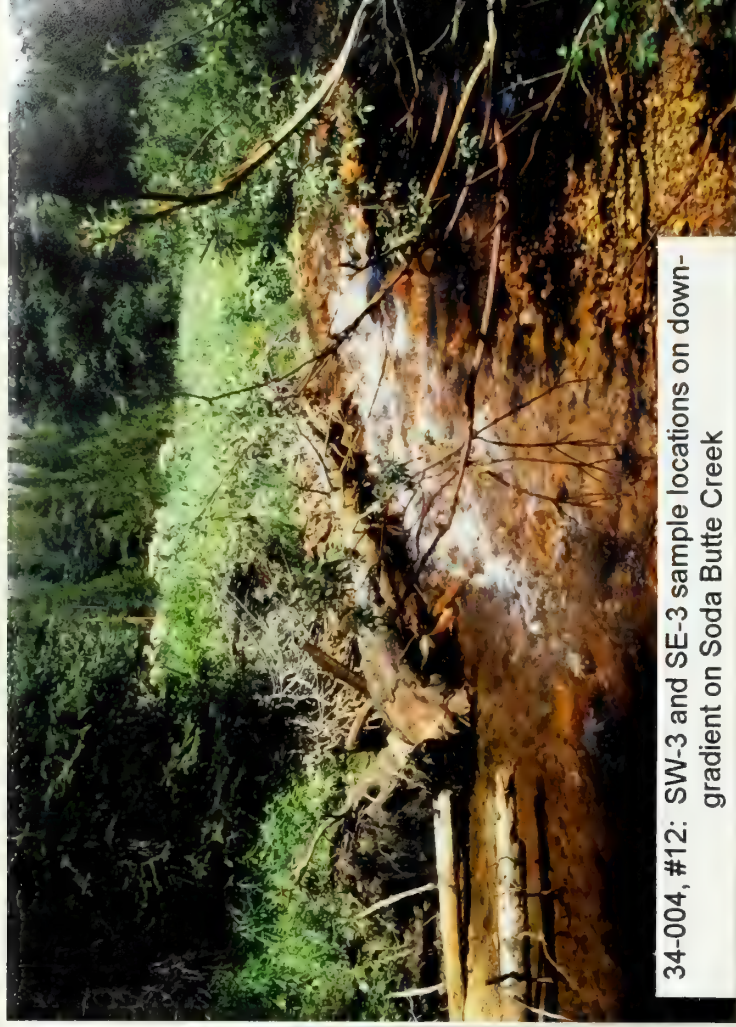


34-004, #10: TP-1 (foreground) and WR-1 (background)





34-004, #11: Seep from TP-1; GW-1 sample location



34-004, #12: SW-3 and SE-3 sample locations on downstream gradient on Soda Butte Creek



34-004, #13: SW-2 and SE-2 sample locations on unnamed tributary flowing into Soda Butte Creek



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: LOWER GLENGARRY PA#: 34-006

Date: August 9, 1993 Time: 0800-1400

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; winds at approx.  
15 mph; 70°F; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #18: WR-1 and mill  
area; #19: TP-1 and panorama of WR-1 and mill; #21: WR-2; #22: SW-2  
sample location at WR-1 seep; #23: Close-up of mill and vegetation  
test plots; #24: GW-2 sample location at Adit #2; #25: GW-1, SW-3,  
and SE-2 sample locations; #26: SW-4 and SE-3 sample locations;  
#27: SW-1 and SE-1 sample locations and gaging station.

Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site was by truck. Numerous full and empty bags of lime  
are lying around on the site (used for recent reclamation  
activities). Most areas have been recently hydromulched although  
reclamation success appears to be very limited to date.

Other Hazardous Materials/Substances Present: One of two  
transformers on-site may be full. Tanks on the site sound empty,  
but may contain sludge.

General Comments on Potential Remedial Alternatives: Isolate waste  
from active stream channels and runoff paths. Complete grading,  
amending, and revegetation of waste materials. Study water  
treatment requirements and alternatives.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): LOWER GLENGARRY PA#: 34-006

Legal Description: T 9S ; R 14E ; Sec. 11 , NW1/4 NE1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 04' 05" Longitude: W 109° 56' 05"

Primary Drainage Basin and Code: Clark Fork Yellowstone/10070006

Secondary Drainage Basin: Fisher Creek

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active     , Inactive/Exploration X , Abandoned     .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Crown Butte  
Mines, Inc., Petroleum Building, Suite 510, 2812 1st Avenue N,  
Billings, MT 59101. (406) 245-3455; Gallatin National Forest.

Relationship to other mines/sites in the area/district: This site  
is located north of the Gold Dust and west of the McLaren Mine.  
Numerous mines are in the area.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Recent hydromulching and waste  
amendment/revegetation test plots conducted by Crown Butte Mines  
and USFS. This site is within Crown Butte's proposed permit area.

General site features: Elevation 9400' , Slope 30° ,  
Aspect East

Land use: Mining X , Recreational X , Residential     , Urban     ,  
Agricultural     , Other (Specify)    

Area of disturbed/unvegetated lands? 3.25 acres.  
Dimensions:    

Predominant vegetation types: White bark and Lodgepole pines, Sub-  
alpine fir, grasses, unidentified shrubs

Access: roads - good X , poor     , 4wd     , trail     .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 16 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Mine workings of the Glengarry group are developed on contact metamorphic deposit. This deposit is enclosed by Gros Ventre limestone near contacts with gabbro and monzonite porphyry. The site lies on headwaters of perennial Fisher Creek. Fisher Creek flows southwest through the site and approx. 3.5 miles away, joins the Clark Fork of the Yellowstone River.

Mining/milling history, ore type/tenor, host rock, gangue: Mine was closed in 1967 due to an avalanche. Some ore was shipped to the Rommel Mill for processing. Predominant ore minerals are auriferous pyrite and chalcopyrite with occasional minor amounts of boronite and chalcopyrite.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 4, Comment 2 open and discharging  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes X, No     . If yes answer the next three questions:

Period(s) of Operation: Unknown

Origin of Ore Milled - Custom Mill      Dedicated Mill X; Number and names of mines that supplied mill feed: Upper and Lower Glengarry Mines

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? 25-ton floatation mill driven by a 150 horse power diesel engine

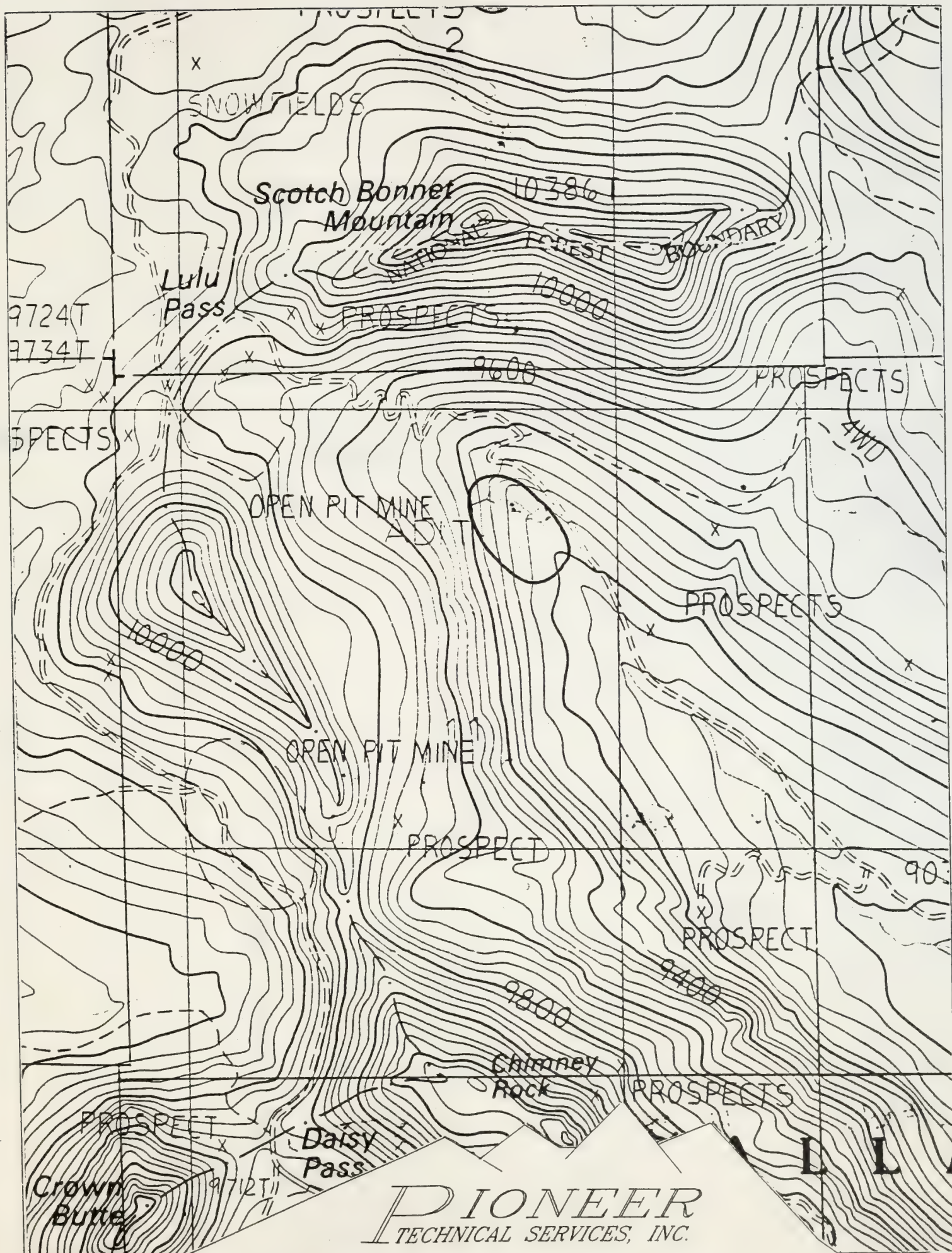


Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:8245	09S 14E 02	0.0	0.0	1.50
M:8247	09S 14E 02 CC	0.0	0.0	4.60
M:8248	09S 14E 02 CCD	0.0	0.0	3.30
M:8249	09S 14E 02 CCD	0.0	0.0	4.70
M:121504	09S 14E 03 D	17.0	0.0	0.00
M:121503	09S 14E 03 D	22.0	0.0	0.00
M:121501	09S 14E 03 D	25.0	0.0	0.00
M:121502	09S 14E 03 D	20.5	0.0	0.00
M:130282	09S 14E 11 A	37.0	0.0	0.00
M:130283	09S 14E 11 A	60.0	0.0	0.00
M:8279	09S 14E 11 CB	0.0	0.0	11.60
M:130288	09S 14E 11 D	71.5	0.0	0.00
M:130284	09S 14E 11 D	45.5	0.0	0.00
M:130287	09S 14E 11 D	30.0	0.0	0.00
M:130290	09S 14E 11 D	12.5	0.0	0.00
M:130292	09S 14E 12 C	28.3	0.0	0.00





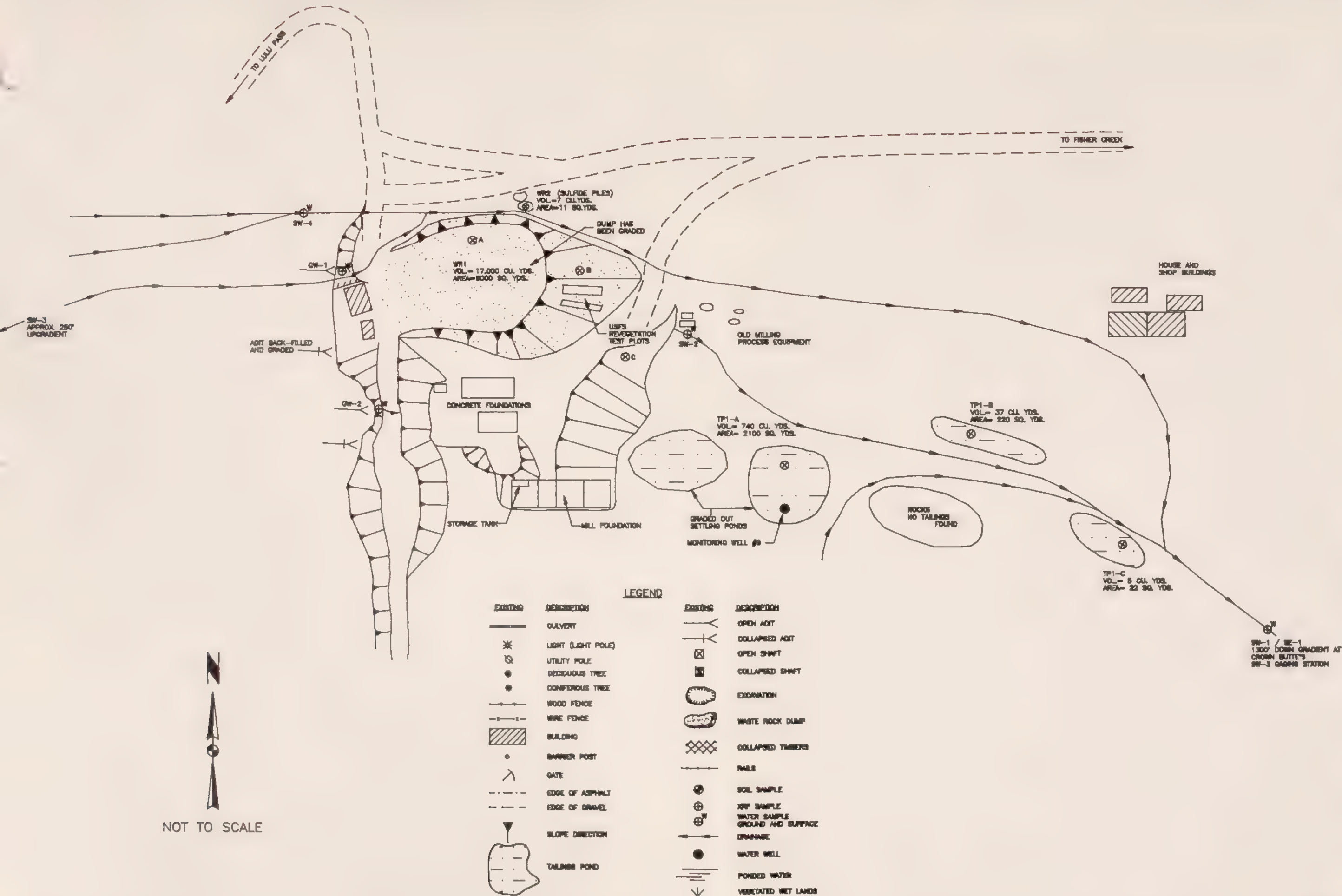
LOWER GLENGARRY, P.A. NO. 34-006

T09S, R14E, SECTION 11

SCALE: 1" = 1000'







MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

LOWER GLENGARRY PA#34-006  
NEW WORLD DISTRICT PARK COUNTY

**PIONEER**  
ENGINEERING & CONSULTANTS  
**TDSH**

DRAWN: JTP DATE: 15 NOV 93  
DESIGNED: TPR JOB NO: 93-17  
APPROVED: WJB F.B. NO:  
THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): 60% sand, 30% silt, 10% clay

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): No impoundment; no deep tailings were identified.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment; most areas have been recently hydromulched although reclamation success appears very limited.

Comments on potential for mitigation: Remove wastes from active stream channel.



# SOURCE INVENTORY FORM

SAMPLERS: Bullock, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	17,000	Top of WR-1 on east side	Partially Reclaimed	5.8 (D)	0.055	34-006-WR-1	08/09/93 1300	T-Metals, ABA
WR-1B	WR		Middle slope of WR-1 near test plots	Partially Reclaimed	5.7 (D)	0.07			
WR-1C	WR		On second tier of WR-1	Partially Reclaimed	5.8 (D)	0.065			
WR-2	WR	7	Small sulfide pile just off road	None	< 3.5 (D)	0.05	34-006-WR-2	08/09/93 1310	T-Metals, ABA
TP-1A	TAIL	740	West side near mill	None	6.0 (D)	0.03	34-006-TP-1	08/09/93 1320	T-Metals, ABA
TP-1B	TAIL	37	West side near end of site	None	6.1 (D)	0.035			
TP-1C	TAIL	5	East side near two main channels	None	5.2 (D)	0.03			
SS-1	BKGRND	N/A	Background soil taken northeast of site	N/A	N/A	N/A	34-006-SS-1	08/09/93 1200	T-Metals

0-Direct reading (Salvey Meter); 9-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 34-006-WR-1 is composite of WR-1A through -1C. 34-006-WR-2 is grab of WR-2. 34-006-TP-1 is composite of TP-1A through -1C.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 2 Identification: Adit associated with WR-1 and Adit #2 southwest of Adit #1

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes X, No     , Number: 1 Identification: Discharge from GW-1 partly infiltrates into WR-1 and reappears at the base; SW-2 sample

Groundwater wells within 4 miles?: Yes X, No     ;  
Number of well logs: 113

Distance to nearest well used for drinking? Approx. 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable X, Possible     , Unlikely     .

Water is flowing from both adits as well as discharge from base of WR-1. Because of the elevation of metal levels, slopes, and abundance of water in the area, groundwater contamination is likely.

Other observations/notes: N/A

**SAMPLERS:** Belanger

[illegible]

FLOW: Estimated (E) or Measured (M) from edit, sheet, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Fisher Creek

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-1

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 1.5 during investigation  
High Flow: 15 cfs, Average Flow: 1.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Discharge from Adit #1 flows over WR-1 and Fisher Creek flows  
alongside of WR-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Yellowstone Park, wilderness area, fishery, recreation, stock watering,  
T&E - Bald Eagle and Grizzly

Observed erosional/sedimentation/stream turbidity problems? Yes X,  
No     , Distance downstream (ft)? >500 Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present):       
Sedimentation and erosional problems are visually present in this  
drainage below the site.



**SAMPLERS:** Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 10 to 15 acres

Wetlands present: Yes \_\_, No X, Describe: \_\_\_\_\_

Carbonate rocks/soils: Yes X, No   , Describe: Host rock is described  
as Gros Ventre limestone; none observed on the site.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_;  
100-300 X; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or  
greater\_\_\_\_; Comments

Nearest residence(ft or miles)? 2.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Bullock, Belanger

[illegible]

### Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Off-  
road vehicle riders, tourists, hikers

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes X, No\_\_\_\_, Comment Yellowstone  
Wilderness Area - Yes X, No\_\_\_\_, Comment Absaroka/Beartooth  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Bald Eagle  
Bat Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low X  
Fisheries Habitat and Species Classification - 6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Adit #1 is open, but has a locked gate. Adit #2 is partially caved, but  
is still a possible hazard.

Hazardous structures: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Old cabins

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number\_\_\_\_, types and locations: Streambanks are cut and eroding the  
tailings and waste rock below the site.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: \_\_\_\_\_

## Bibliography

Crown Butte Mines, Inc., Application for a Hard Rock Operating Permit and Proposed Plan of Operations, New World Project, February 1993.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/WQB, Analytical Data for Lower Glengarry, September 25, 1979.

MDSL/AMRB, Environmental Assessment Analytical Data for Lower Glengarry, Prepared by MSE, Inc., October 4 and 29, 1990.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Lower Glengarry, Prepared by Mark Carlstrom and Ben Mundie, September 25, 1979.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Lower Glengarry, Prepared by Chen-Northern, August 18, 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Lower Glengarry, Prepared by Delta Engineering, Date Unknown.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1989.





LABORATORY ANALYTICAL DATA

LOWER GLENGARRY  
PA NO. 34-006



Lower Glengarry PA# 34-006  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/09/93

SOLID MATRIX ANALYSES

Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-006-SE-1	86.6 J	113	0.6 U	4.14 J	9.39	371	57500	0.066 J	492 J	2.76 U	92.1 J	6.69 U	74	NR
34-006-SE-2	20.1 J	76.2	0.7 U	5.5 J	11.8	601	93900	0.051 J	494 J	5.45	377 J	8.46 U	197	NR
34-006-SE-3	74.6 J	98.8	0.7 U	2.83 J	6.21	415	54500	0.042 J	319 J	5.21	73.1 J	8.39 U	67.9	NR
34-006-TP-1	22.6 J	33.4	0.7 U	3.96 J	32.1	377	141000	0.036 J	73.7 J	5.1	106 J	8.42 U	41.1	NR
34-006-WR-1	50.2 J	142	0.5 U	2.11 J	4.67	421	60000	2.14 J	233 J	2.34 U	109 J	5.67 U	29.1	NR
34-006-WR-2	53.6 J	11.8	3.6	1.96 U	1.38 U	1260	185000	0.038 J	1.45 J	2.56 U	116 J	6.2 U	50.1	NR
BACKGROUND	8.61 J	71.7	0.9	12.4 J	27	66.9	17100	0.02 J	461 J	23.9	28.3 J	5.49 U	69.9	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000t	NEUTRAL POTENT. v/1000t	SULFUR ACID BASE POTENT. v/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. v/1000t	SULFUR ACID BASE POTENT. v/1000t
34-006-WR-1	0.77	24.1	-1.68	-25.7	0.23	0.16	0.38	5.00	-6.68
34-006-WR-2	45.6	1426	-4.79	-1431	0.31	<0.01	47.2	0.00	-4.79
34-006-WR-3	0.75	23.4	-4.13	-27.6	0.32	<0.01	0.53	0.00	-4.13

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-006-GW-1	7.31	8.3	2.57 U	46.1	10.6	7730 JX	85600 JX	0.09 J	5610	99.2 J	40.1	30.7 U	671	202
34-006-GW-2	2.27	13.7	2.57 U	21.4	6.83 U	121 JX	14200 JX	0.11 J	1020	20.5 J	2.45	30.7 U	127	38.8
34-006-SW-1	1.21	28.6	2.57 U	11.7	6.83 U	1340 JX	7960 JX	0.25 J	794	26 J	9.56	30.7 U	133	47.2
34-006-SW-2	1.89	20.1	2.57 U	15.4	6.83 U	1170 JX	3160 JX	0.08 J	722	32.5 J	8.2	30.7 U	137	42.6
34-006-SW-3	1.93	37.1	2.57 U	9.7 U	6.83 U	761 JX	187 JX	0.07 J	56.4	12.7 U	3.17	30.7 U	34.7	7.1
34-006-SW-4	0.96 U	42.5	2.57 U	9.7 U	6.83 U	646 JX	3750 JX	0.09 J	346	13.9 J	6.49	30.7 U	55.9	24.9

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-006-GW-1	763	10	489	< 0.05	NR
34-006-GW-2	165	< 5.0	77	< 0.05	NR
34-006-SW-1	168	< 5.0	87	< 0.05	NR
34-006-SW-2	186	< 5.0	94	< 0.05	NR
34-006-SW-3	98	< 5.0	26	0.11	NR
34-006-SW-4	121	< 5.0	56	0.05	NR

LEGEND

- SE1 - Downgradient of site on Fisher Creek.
- SE2 - Upgradient of site on headwaters of Fisher Creek.
- SE3 - Upgradient stream (unnamed).
- TP1 - Composite of subsamples TP1A, 1B, and 1C.
- WR1 - Composite of subsamples WR1A, 1B, and 1C.
- WR2 - Sample of the WR2 subsample.
- BACKGROUND - From the Lower Glengarry Mine (34-006-SS-1).
- GW1 - Discharge from adit #1.
- GW2 - Discharge from adit #2.
- SW1 - Downgradient of site on Fisher Creek.
- SW2 - Discharge from waste rock dump 1 base.
- SW3 - Upgradient of site on headwaters of Fisher Creek.
- SW4 - Upgradient stream (unnamed).





**XRF ANALYSIS RESULTS**

**LOWER GLENGARRY  
PA NO. 34-006**





\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

LOWER GLENGARRY  
PA NO. 34-006





# **AIMSS SCORESHEET**

**SITE NAME:** LOWER GLENGARRY  
**PA NUMBER:** 34-006

LINE NO.		<b>GROUNDWATER PATHWAY</b>	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	40.0
7	GW - TARGETS	WELLS - 1 TO 4 MI	97
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
			387820
		<b>SURFACE WATER PATHWAY</b>	
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	100
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	1
18	SW - TARGETS	WETLANDS	10
19		FISHERY	0
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 THRU 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
			235244
		<b>AIR PATHWAY</b>	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	100
30	AIR - TARGETS	NEAREST RESIDENCE	0
31		WETLANDS	0
32		PARKS / WILDERNESS	10
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 THRU 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			242
		<b>DIRECT CONTACT PATHWAY</b>	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	0
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	10
43		TARGETS SCORE	SUM LINES 40 THRU 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			35
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		
	(LINES 10 + 24 + 35 + 44) / 100,000		6.23

SITE NAME: LOWER GLENGARRY  
PA NUMBER: 34-006

LINE NO.	SITE SAFETY		
1	THREAT	ACCESSIBILITY	20
2		OPEN SHAFTS 100 EA.	0
3		OPEN ADITS 50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS 75 EA.	0
5		HAZ. STRUCTURES 40 EA.	80
6		EXPLOSIVES	0
7		HAZ. MATERIALS	100
8		HAZARDS SCORE SUM LINES 2 THRU 7	280
9		POPULATION - 1 MILE	0
10	TARGETS	NEAREST RESIDENCE	0
11		RECREATIONAL USE	10
12		TARGETS SCORE SUM LINES 9 THRU 11	10
13		SITE SAFETY SCORE (LINES 1 x 8 x 12) / 1,000	56.00



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

TE HEALTH DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	PARK
LAT.-LONG.	45 41N 1095736W	SAMPLE LOCATION	9S 14E 1188B
STATION CODE		ANALYSIS NUMBER	79W2539
DATE SAMPLED	09-25-79	DRAINAGE BASIN	043D -CLARKS FK.
TIME SAMPLED		WATER FLOW RATE	3.0 GPM(E)
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	FLOAT + TIME
SAMPLE SOURCE	MINE DRAIN	ALTITUDE OF LAND SURFACE	9500. FT
WATER USE	UNKNOWN	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	DSL	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: GLENGARRY MINE (A) MINE DRAINAGE

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)		
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	0.0	0.000
-------------	-----	-----	------------	-----	-------

LABORATORY PH	TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)	TOT ALKALINITY(MG/L-CACO3)
FM-DISS. IONS MEAS.(MG/L)	LABORATORY TURBIDITY (NTU)
AB CONDUCTIVITY-UMHOS-25C	SODIUM ADSORPTION RATIO

A D D I T I O N A L P A R A M E T E R S

ZINC, TR (MG/L AS ZN)	.04	MERCURY, TR (MG/L AS HG)	< .0002
IRON, TR (MG/L AS FE)	.28	MANGANESE, TR (MG/L AS MN)	.20
PH, FIELD(SU)	5.5	ANTIMONY (TR MG/L 19556)	< 0.2
TIN, TR (MG/L AS SN)	< 0.8		

MARKS: A M L

PLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER  
 L=CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
 )=MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO	AML 12	SAMPLER	BAM	HANDLING	11	ANALYST	DB	LAB	QQBH
COMPLETED	11-08-79	COMPUTER RUN	11/26/79	DATA	0975/PRDG	0876	FUND	6150	
IND DEV.	ION BALANCE	0.00	CA	MG	NA	K	CL	SO4	HCO3
COMMENT	MPDES		0.0	0.0	0.0	0.0	33.3	33.3	0.0
LC. MEQ/L=	INSUFFICIENT DATA								

79W2539









REPORT DATE: October 4, « 1990

CLIENT: Abandon Mines

FIELD ID: Lower Glengarry-Fisher Creek Down Gradient

LAB NO: W8583

DATE RECEIVED: 09-14-90

Hardness 55 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As <0.001 mg/L

Cd 0.0006 mg/L

Cu 1.29 mg/L

Fe 9.94 mg/L

Pb 0.004 mg/L

Zn 0.16 mg/L

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Lower Glengarry-Adit #1

LAB NO: W8585

DATE RECEIVED: 09-14-90

Hardness 122 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.004 mg/L

Cd 0.0012 mg/L

Cu 2.61 mg/L

Fe 55.1 mg/L

Pb 0.014 mg/L

Zn 0.41 mg/L





DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Lower Glengarry Eroding Dump--09/07/90

LAB NO: S2693

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 1.88 SU

Total Metals

As 260 mg/Kg

Cd 64 mg/Kg

Cu 56 mg/Kg

Fe 181,000 mg/Kg

Pb 91 mg/Kg

Zn 32 mg/Kg

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Tailings Lower Glengarry--09/07/90

LAB NO: S2694

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 3.16 SU

Total Metals

As 177 mg/Kg

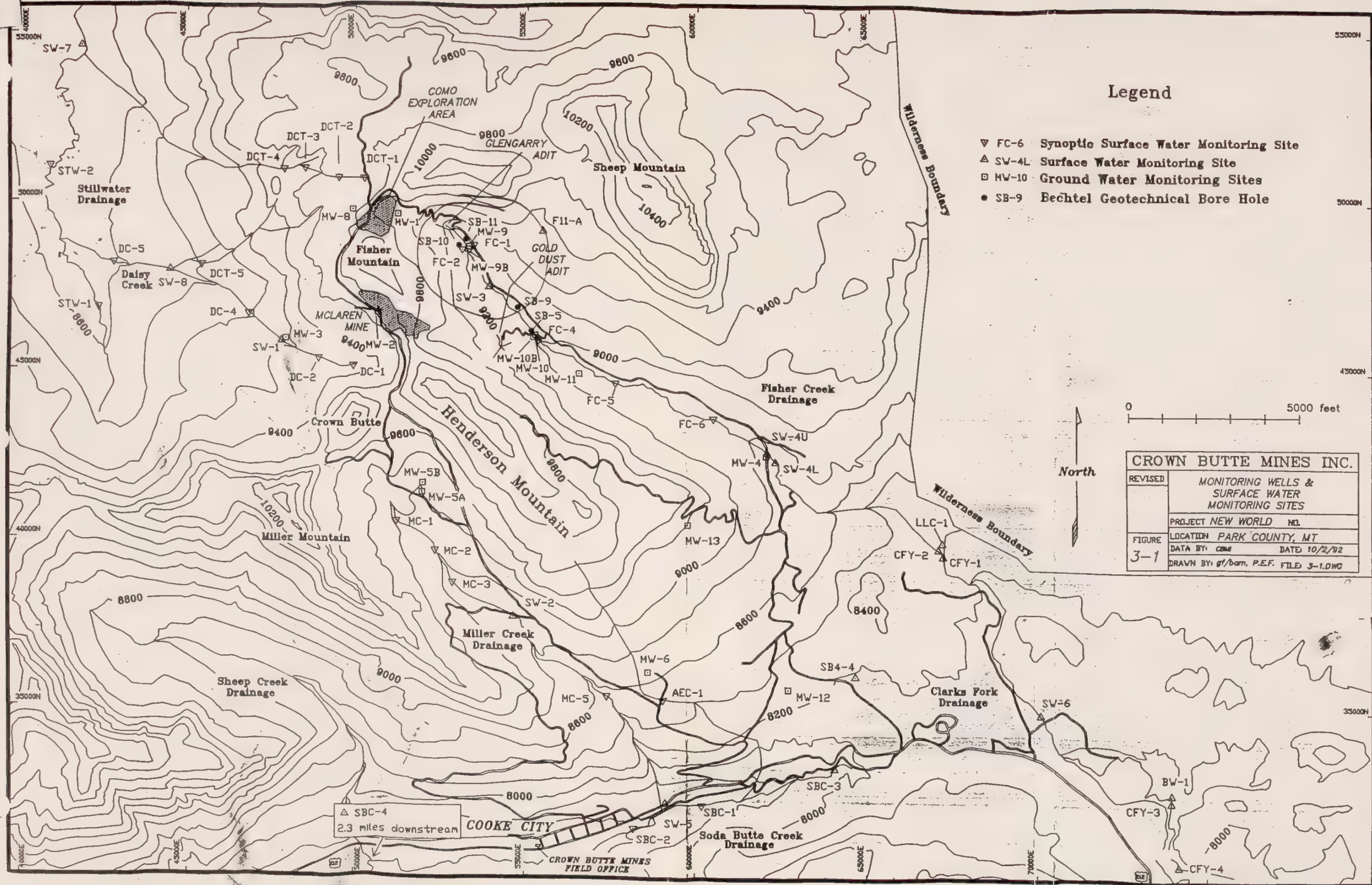
Cd 15 mg/Kg

Cu 282 mg/Kg

Fe 73.800 mg/Kg

Pb 124 mg/Kg

Zn 26 mg/Kg



# Legend

- ▽ FC-6 Synoptic Surface Water Monitoring Site
- △ SW-4L Surface Water Monitoring Site
- MW-10 Ground Water Monitoring Sites
- SB-9 Bechtel Geotechnical Bore Hole

0 5000 feet



CROWN BUTTE MINES INC.	
REVISED	MONITORING WELLS & SURFACE WATER MONITORING SITES
	PROJECT NEW WORLD NL
FIGURE	LOCATION PARK COUNTY, MT
3-1	DATA BY: CEM DATE: 10/2/92
	DRAWN BY: g/barn, P.E.F. FILE: 3-1.DWG





Sample Type: Groundwater

SITE CODE	MM-8	MM-8	MM-8	MM-9	MM-9	MM-9	MM-9	MM-9	MM-9
SAMPLE DATE	07/11/91	08/13/91	10/01/91	07/10/91	08/13/91	10/01/91	10/01/91	10/09/91	12/11/91
LAB	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN		
LAB NUMBER	117614		120608	117577		120609	120610		
SAMPLE NUMBER	MMW-9107-157	MMW-9108-905	MMW-9110-307	MMW-9107-300	MMW-9108-907	MMW-9110-308	MMW-9110-309	MMW-9110-900	MMW-9112-901
									MMW-9110-902
-- PHYSICAL PARAMETERS --									
DEPTH TO WATER LEVEL (ft)	13.18	13.29	13.54	4.67	4.78	5.13	5.13	5.22	6.42
EH (MILLIVOLTS) (FLD)			-054	+027		-139.0	-139.0		
PH (FLD)	7.1		8.16	6.67		9.52	9.52		
PH			6.9	5.4		4.4	4.4		
SC (UMHOS/CM @ 25 C) (FLD)			555.0	104.0		108.0	110.0		
SC (UMHOS/CM @ 25 C)	615.0		594.0	112.0		139.0	150.0		
TDS (@ 180 C)	407.0		377.0	87.0		99.0	113.0		
TOTAL SUSPENDED SOLIDS	44.0		22.0	2800.0		605.0	600.0		
TURBIDITY			15.0			950.0	850.0		
WATER TEMPERATURE (FLD)			2.5	4.0		4.5	4.5		Flowing

-- COMMON IONS --

TOTAL HARDNESS AS CaCO3	342.0
CALCIUM (CA) (DIS)	63.0
MAGNESIUM (MG) (DIS)	45.0
SODIUM (NA) (DIS)	3.0
POTASSIUM (K) (DIS)	1.0
TOTAL ALKALINITY AS CaCO3	184.0
ACIDITY AS CaCO3	225.0
BICARBONATE (HCO3)	0.0
CARBONATE AS CO3	159.0
SULFATE (SO4)	<1.0
CHLORIDE (CL)	0.0
HYDROXIDE (OH)	

-- NUTRIENTS --

AMMONIA (NH3 AS N)	<0.05
KJELDAHL NITROGEN AS N	<0.2
NITRATE + NITRITE AS N	0.15
ORTHO-PHOSPHATE (PO4-P)	0.06
PHOSPHORUS (P) *TOT	0.08

-- TRACE ELEMENTS --

ALUMINUM (AL) *DIS	0.1
--------------------	-----

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
Blank line indicates parameter not tested.

Sample Type: Groundwater

SITE CODE	MM-8	MM-8	MM-9	MM-9	MM-9	MM-9	MM-9
SAMPLE DATE	07/11/91	08/13/91	10/01/91	08/13/91	10/01/91	10/01/91	12/11/91
LAB	CHEN	CHEN	CHEN	CHEN	CHEN	CHEN	
LAB NUMBER	117614	120608	120609	120610	120609	120610	
SAMPLE NUMBER	MMW-9107-157	MMW-9108-905	MMW-9110-307	MMW-9108-907	MMW-9110-308	MMW-9110-309	MMW-9112-901
							MMW-9110-900

-- TRACE ELEMENTS --

ANTHONY (SB) *DIS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ARSENIC (AS) *DIS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BARITUM (BA) *DIS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BERYLLIUM (BE) *DIS	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
CADMIUM (CD) *DIS	0.0001	0.0002	0.0002	0.0002	0.0004	0.0003	0.0003
CHROMIUM (CR) *DIS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
COPPER (CU) *DIS	<0.001	<0.001	0.005	0.005	0.001	0.001	0.001
IRON (FE) *DIS	<0.03	0.05	1.1	1.1	3.27	3.29	3.29
LEAD (PB) *DIS	<0.002 J2	<0.002	<0.002 J2	<0.002 J2	<0.002	<0.002	<0.002
MANGANESE (MN) *DIS	<0.02	<0.02	0.05	0.05	0.04	0.04	0.04
MERCURY (HG) *DIS	0.0004 J2	<0.0001	<0.0001 J2	<0.0001 J2	<0.0001	<0.0001	<0.0001
MOLYBDENUM (MO) *DIS	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
NICKEL (NI) *DIS	0.03	<0.03	0.04	0.04	<0.03	<0.03	<0.03
SELENIUM (SE) *DIS	<0.005 J2	<0.005	<0.005 J2	<0.005 J2	<0.005	<0.005	<0.005
SELENIUM (SE) *TRC		<0.005			<0.005	<0.005	<0.005
SILVER (AG) *DIS	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
THALLIUM (TL) *DIS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
ZINC (ZN) *DIS	0.01	0.11	0.03	0.03	0.01	0.01	0.01

-- OTHER PARAMETERS --

CYANIDE (CN) *TOT	0.005	<0.005
CYANIDE (CN) *WAO	<0.005	

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
 Blank line indicates parameter not tested.





Statistical Summary  
Site: MW-9

	Historical Data Range:		Mean	Standard Deviation	Median	Number of Samples N NLT	t-TEST for Mean 99% Confidence Interval
	Result	Date					
OTHER PARAMETERS	<0.00500	1990-91				3	
CYANIDE (CN) (TOT)						3	

Sample Type: Groundwater

SITE CODE	SB-9	SB-9	SB-9	SB-10	SB-10	SB-10	SB-10	SB-11A	SB-11A
SAMPLE DATE	07/11/91	08/13/91	10/01/91	08/13/91	10/01/91	10/09/91	10/09/91	07/11/91	08/13/91
LAB	CHEN		CHEN	CHEN	CHEN			CHEN	
LAB NUMBER	117588		120614	117589	120615			117590	
SAMPLE NUMBER	NMW-9107-311	NMW-9108-914	NMW-9110-313	NMW-9107-312	NMW-9110-314	NMW-9110-906		NMW-9107-313	NMW-9108-911

-- PHYSICAL PARAMETERS --

DEPTH TO WATER LEVEL (ft)	0.16	0.79	.54	1.73	3.16	3.28	1.98	6.86
EH (MILLIVOLTS) (FLD)	+006		-092	+099	+041		+048	
PH (FLD)	6.46		8.65	5.28	8.16		6.28	
PH	7.0		6.8	4.5	3.7		6.0	
SC (UMHOS/CM @ 25 C) (FLD)	528.0		1268.0	261.0	217.0		88.0	
SC (UMHOS/CM @ 25 C)	548.0		1540.0	294.0	351.0		66.0	
TDS (@ 180 C)	409.0		1180.0	212.0	217.0		66.0	
TOTAL SUSPENDED SOLIDS	27.0		52.0	35.0	56.0		780.0	
TURBIDITY			110.0		110.0			
WATER TEMPERATURE (FLD)	6.0		4.0	6.7	4.0		1.0	

-- COMMON IONS --

TOTAL HARDNESS AS CaCO3	236.0		748.0	52.0	55.0		<27.0	
CALCIUM (CA) (DIS)	75.0		237.0	14.0	12.0		9.0	
MAGNESIUM (MG) (DIS)	12.0		38.0	4.0	6.0		<1.0	
SODIUM (NA) (DIS)	25.0		68.0	7.0	5.0		3.0	
POTASSIUM (K) (DIS)	2.0		6.0	2.0	3.0		10.0	
TOTAL ALKALINITY AS CaCO3	55.0		80.0	<1.0	<1.0		<1.0	
ACIDITY AS CaCO3				56.0	51.0		<1.0	
BICARBONATE (HCO3)	67.0		97.0	<1.0	<1.0		<1.0	
CARBONATE AS CO3	0.0		0.0	0.0	0.0		0.0	
SULFATE (SO4)	240.0		812.0	119.0	108.0		35.0	
CHLORIDE (CL)	1.0		8.0	<1.0	3.0		<1.0	
HYDROXIDE (OH)			0.0		0.0			

-- NUTRIENTS --

AMMONIA (NH3 AS N)	<0.05		0.16	0.06	0.17		0.18	
KJELDAHL NITROGEN AS N	0.23		0.28	<0.2	0.41		0.64	
NITRATE + NITRITE AS N	<0.05		<0.05	<0.05	<0.05		<0.05	
ORTHO-PHOSPHATE (PO4-P)	<0.02		0.2	0.06	0.32		0.38	
PHOSPHORUS (P) *TOT	0.03		0.18	0.07	0.41		1.0	

-- TRACE ELEMENTS --

ALUMINUM (AL) *DIS	0.11		0.2	2.5	3.7		0.24	
--------------------	------	--	-----	-----	-----	--	------	--

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
 Blank line indicates parameter not tested.



SUMMARY WATER QUALITY ANALYSES  
MMW-01 - Noranda New World - Nor NM Permit

Sample Type: Groundwater

SITE CODE	SAMPLE DATE	LAB	LAB NUMBER	SAMPLE NUMBER	SB-9 08/13/91 CHEN 117588	SB-9 10/01/91 CHEN 120614	SB-9 10/09/91	SB-10 07/11/91 CHEN 117589	SB-10 08/13/91	SB-10 10/01/91 CHEN 120615	SB-10 10/09/91	SB-11A 07/11/91 CHEN 117590	SB-11A 08/13/91
MMW-9107-311	MMW-9108-914	MMW-9110-313	MMW-9110-905	MMW-9107-312	MMW-9108-912	MMW-9110-314	MMW-9110-906	MMW-9107-313	MMW-9108-911				
-- TRACE ELEMENTS --													
ANTIMONY (SB) *DIS	<0.05												
ARSENIC (AS) *DIS	<0.005												
BARIUM (BA) *DIS	<0.1												
BERYLLIUM (BE) *DIS	<0.005												
CADMIUM (CD) *DIS	0.0003												
CHROMIUM (CR) *DIS	<0.02												
COPPER (CU) *DIS	<0.001												
IRON (FE) *DIS	1.34												
LEAD (PB) *DIS	<0.002 J2												
MANGANESE (MN) *DIS	0.14												
MERCURY (HG) *DIS	<0.0001 J2												
MOLYBDENUM (MO) *DIS	0.013												
NICKEL (NI) *DIS	<0.03												
SELENIUM (SE) *DIS	<0.005 J2												
SELENIUM (SE) *TRC													
SILVER (AG) *DIS	<0.0005												
THALLIUM (TL) *DIS	<0.1												
ZINC (ZN) *DIS	<0.01												
-- OTHER PARAMETERS --													
CYANIDE (CN) *TOT	<0.005												
* DIS - Dissolved													
* FRE - Free													
* TOT - Total													
* TRC - Total Recoverable													
* WAD - Weak Acid Dissociable													

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
Blank line indicates parameter not tested.

Sample Type: Groundwater

SITE CODE	SB-11A	SB-11A	SB-13	SB-14	SB-14A	SB-14A
SAMPLE DATE	10/01/91	10/09/91	10/09/91	10/09/91	11/07/91	12/11/91
LAB	CHEN					
LAB NUMBER	120616					
SAMPLE NUMBER	NMW-9110-315	NMW-9110-907	NMW-9110-909	NMW-9110-910	NMW-9111-901	NMW-9112-907

-- PHYSICAL PARAMETERS --

DEPTH TO WATER LEVEL (ft)	9.34	9.65	10.5	17.62	16.33	17.9
EII (MILLIVOLTS) (FLD)	-064					
PH (FLD)	8.53					
PH	6.4					
SC (UMDS/CM @ 25 C) (FLD)	130.0					
SC (UMDS/CM @ 25 C)	149.0					
TDS (@ 180 C)	121.0					
TOTAL SUSPENDED SOLIDS	1920.0					
TURBIDITY	1500.0					
WATER TEMPERATURE (FLD)	4.0					

-- COMMON IONS --

TOTAL HARDNESS AS CaCO3	53.0
CALCIUM (CA) (DIS)	16.0
MAGNESIUM (MG) (DIS)	3.0
SODIUM (NA) (DIS)	<1.0
POTASSIUM (K) (DIS)	17.0
TOTAL ALKALINITY AS CaCO3	12.0
BICARBONATE (HCO3)	15.0
CARBONATE AS CO3	0.0
SULFATE (SO4)	57.0
CHLORIDE (CL)	3.0
HYDROXIDE (OH)	0.0

-- NUTRIENTS --

AMMONIA (NH3 AS N)	0.08
KJELDAHL NITROGEN AS N	1.4
NITRATE + NITRITE AS N	0.06
ORTHO-PHOSPHATE (PO4-P)	1.41
PHOSPHORUS (P) *TOT	6.24

-- TRACE ELEMENTS --

ALUMINUM (AL) *DIS	0.3
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- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAD - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
 Blank line indicates parameter not tested.

Sample Type: Groundwater

SITE CODE	SB-11A	SB-11A	SB-13	SB-14	SB-14	SB-14A	SB-14A	SB-14A
SAMPLE DATE	10/01/91	10/09/91	10/09/91	10/09/91	12/11/91	10/09/91	11/07/91	12/11/91
LAB	CHEN							
LAB NUMBER	120616							
SAMPLE NUMBER	MMW-9110-315	MMW-9110-907	MMW-9110-909	MMW-9110-910	MMW-9112-908	MMW-9110-911	MMW-9111-901	MMW-9112-907

-- TRACE ELEMENTS --

ANTIMONY (SB) *DIS	<0.05
ARSENIC (AS) *DIS	<0.005
BARIUM (BA) *DIS	<0.1
BERYLLIUM (BE) *DIS	<0.005
CADMIUM (CD) *DIS	0.0011
CHROMIUM (CR) *DIS	<0.02
COPPER (CU) *DIS	0.007
IRON (FE) *DIS	0.19
LEAD (PB) *DIS	<0.002
MANGANESE (MN) *DIS	<0.02
MERCURY (HG) *DIS	<0.0001
MOLYBDENUM (MO) *DIS	<0.005
NICKEL (NI) *DIS	<0.03
SELENIUM (SE) *DIS	<0.005
SELENIUM (SE) *TRC	<0.005
SILVER (AG) *DIS	0.0012
THALLIUM (TL) *DIS	<0.1
ZINC (ZN) *DIS	0.02

-- OTHER PARAMETERS --

CYANIDE (CN) *TOT	<0.005
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- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAO - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
 Blank line indicates parameter not tested.



Statistical Summary  
Site: SB-10

		Historical Data Range:		Mean	Standard Deviation	Median	Samples H RLI	t-TEST for Mean 99% Confidence Interval
		Result	Date					
PHYSICAL PARAMETERS								
DEPTH TO WATER LEVEL (FT)		1.73000-3.28000	1990-91	2.79500	0.58627	2.99500	6	1.82997-3.76003
OXYGEN (O)		4.50000-5.30000	1990	4.90000			2	
PH (field)		5.02000-8.16000	1990-91	5.30672	7.73512	5.28000	3	0.00000-49.63052
PH		3.50000-4.50000	1990-91	3.69975	0.45735	3.65000	4	2.36406-5.03544
SC (UMHOS/CM @ 25 C) (field)		217.00000-284.00000	1990-91	254.50000	27.79688	257.50000	4	172.81921-335.18079
SC (UMHOS/CM @ 25 C)		294.00000-379.00000	1990-91	344.50000	55.93049	352.50000	4	239.56500-449.43500
10% - CALCULATED		150.00000-160.00000	1990	155.00000			2	
TDS (@ 180 C)		193.00000-226.00000	1990-91	212.00000	13.92839	214.50000	4	171.32214-252.67786
TOTAL SUSPENDED SOLIDS		35.00000-1290.00000	1990-91	642.75000	690.90540	623.00000	4	0.00000-2660.53922
TURBIDITY		110.00000-1240.00000	1990-91	551.66670	604.03500	305.00000	3	0.00000-4012.90892
WATER TEMPERATURE (field)		3.50000-6.70000	1990-91	5.10000	1.58555	5.10000	4	0.46999-9.75001
COMMON IONS								
TOTAL HARDNESS AS CaCO3		52.00000-60.00000	1990-91	55.25000	3.40545	54.50000	4	45.51028-65.18972
CALCIUM (CA) (DIS)		12.00000-14.00000	1990-91	13.50000	1.00000	14.00000	4	10.57950-16.42050
MAGNESIUM (MG) (DIS)		4.00000-6.00000	1990-91	5.25000	0.95745	5.50000	4	2.45383-8.04617
SODIUM (NA) (DIS)		5.00000-7.00000	1990-91	6.25000	0.95745	6.50000	4	3.45383-9.04617
POTASSIUM (K) (DIS)		2.00000-3.00000	1991	2.50000			2	
TOTAL ALKALINITY AS CaCO3		<1.00000	1990-91				4	
ACIDITY AS CaCO3		50.60000-56.00000	1990-91	53.32500	2.92276	53.35000	4	44.78908-61.86092
BICARBONATE (HCO3)		<1.00000	1990-91				4	
CARBONATE AS CO3		0.00000	1990-91				5	
SULFATE (SO4)		108.00000-130.00000	1990-91	119.75000	9.10586	120.50000	4	93.15634-146.34366
CHLORIDE (CL)		<1.00000-3.00000	1990-91	1.12500	1.25000	1.00000	4	0.00000-4.77563
HYDROXIDE (OH)		0.00000	1991				1	
NUTRIENTS								
AMMONIA (NH3 AS N)		<0.06000-0.17000	1990-91	0.10000	0.05852	0.08000	4	0.00000-0.27091
NITROGEN AS N		<0.10000-0.41000	1990-91	0.15250	0.17328	0.15000	4	0.00000-0.65856
NITRATE + NITRITE AS N		<0.05000-0.06000	1990-91	0.05000	0.01750	0.05000	4	0.00000-0.10111
ORTHO-PHOSPHATE (PO4-P)		<0.01000-0.32000	1990-91	0.09750	0.15058	0.03500	4	0.00000-0.53727
PHOSPHORUS (P) (TOT)		<0.01000-0.41000	1990-91	0.12250	0.19410	0.04000	4	0.00000-0.68937
CATION AND ANION BALANCE								
SIGMA		0.29000-0.88000	1990	0.58500			2	
TRACE ELEMENTS								
ALUMINUM (AL) (DIS)		2.50000-3.70000	1990-91	2.97500	0.55000	2.85000	4	1.36873-4.58128
ANTIMONY (SB) (DIS)		<0.05000	1990-91				3	
ARSENIC (AS) (DIS)		<0.00500-0.01800	1990-91	0.00637	0.00775	0.00500	4	0.00000-0.02900
BARIUM (BA) (DIS)		<0.10000	1990-91				4	
BERYLLIUM (BE) (DIS)		<0.00500	1990-91				3	
CADMIUM (CD) (DIS)		<0.00100-0.01000	1990-91	0.00420	0.00432	0.00325	4	0.00000-0.01682
CHROMIUM (CR) (DIS)		<0.02000	1990-91				4	
COPPER (CU) (DIS)		1.48000-1.86000	1990-91	1.70750	0.16153	1.74500	4	1.23575-2.17925
IRON (FE) (DIS)		16.10000-22.40000	1990-91	19.30000	2.71170	19.35000	4	11.38048-27.21952
LEAD (PB) (DIS)		<0.00200-0.01000	1990-91	<0.00600			4	
MANGANESE (MN) (DIS)		0.81000-1.04000	1990-91	0.91750	0.09743	0.91000	4	0.63296-1.20204
MERCURY (HG) (DIS)		<0.00010-0.00100	1990-91	<0.00055			4	
MOLYBDENUM (MO) (DIS)		<0.00500	1990-91				4	
NICKEL (NI) (DIS)		0.03000-0.07000	1990-91	0.05000	0.02000	0.05000	3	0.00000-0.16460
SELENIUM (SE) (DIS)		<0.00500	1990-91				4	
SELENIUM (SE) (TRC)		<0.00050	1991				1	
THALLIUM (TL) (DIS)		<0.00050	1990-91	0.00070			4	

Statistical Summary  
Site: SB-10

TRACE ELEMENTS  
ZINC (ZN) (DIS)  
OTHER PARAMETERS  
CYANIDE (CN) (TOT)

Historical Data Range: Result Date	Mean	Standard Deviation	Median	Number of Samples N HLT	t-TEST for Mean 99% Confidence Interval
0.19000-0.24000 1990-91	0.21250	0.02217	0.21000	4 0	0.14775-0.27725
<0.00500 1990-91				4 4	

All quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); HLT = number of below detection limit results. Robust log-probability regression used for mean and standard deviation estimate, adjusted lognormal maximum likelihood used for median for data with no values below detection limit.

Statistical Summary  
Site: SB-11A

t-TEST for Mean  
99% Confidence Interval

Number of  
Samples  
N NLT

Standard  
Deviation

Mean

Historical Data Range:  
Result Date

PHYSICAL PARAMETERS

DEPTH TO WATER LEVEL (FT)	1.98000-9.65000	1990-91	7.60000	2.92255	8.88500	6	0	2.78932-12.41068
OXYGEN (O)	9.30000-9.60000	1990	9.50000			2	0	
PH (field)	6.28000-8.50000	1990-91	6.74916	9.65907	8.17000	3	0	0.00000-60.95156
PH	6.00000-6.70000	1990-91	6.32015	0.29639	6.65000	4	0	5.46038-7.17992
SC (UMHOS/CM @ 25 C) (field)	88.00000-162.00000	1990-91	130.75000	31.58338	136.50000	4	0	39.09486-222.40516
SC (UMHOS/CM @ 25 C)	66.00000-158.00000	1990-91	130.25000	63.06876	148.50000	4	0	4.46776-256.03226
TDS - CALCULATED	93.00000-113.00000	1990	103.00000			2	0	
TDS (@ 180 C)	66.00000-121.00000	1990-91	101.25000	24.22636	109.00000	4	0	30.49692-172.00308
TOTAL SUSPENDED SOLIDS	780.00000-40200.00000	1990-91	12987.50000	18507.09000	5485.00000	4	0	0.00000-67037.45635
TURBIDITY	1500.00000-5800.00000	1990-91	4533.33300	2454.24800	5700.00000	3	0	0.00000-18396.66838
WATER TEMPERATURE (field)	1.00000-5.50000	1990-91	3.50000	1.87083	3.75000	4	0	0.00000-8.96376

COMMON IONS

TOTAL HARDNESS AS CaCO3	<7.00000-85.00000	1990-91	57.63687	21.66335	56.50000	4	1	0.00000-120.86627
CALCIUM (CA) (DIS)	9.00000-22.00000	1990-91	16.25000	5.45906	17.00000	4	0	0.36523-32.13677
MAGNESIUM (MG) (DIS)	<1.00000-7.00000	1990-91	3.82162	2.59722	3.50000	4	1	0.00000-10.82250
SODIUM (NA) (DIS)	<1.00000-6.00000	1990-91	3.63331	1.87502	3.50000	4	1	0.00000-9.10931
POTASSIUM (K) (DIS)	10.00000-17.00000	1991	13.50000			2	0	
TOTAL ALKALINITY AS CaCO3	<1.00000-22.00000	1990-91	13.89827	6.42445	13.50000	4	1	0.00000-32.66088
ACIDITY AS CaCO3	<1.00000	1991				1	1	
BICARBONATE (HCO3)	<1.00000-26.00000	1990-91	16.90942	7.20869	16.50000	4	1	0.00000-37.96240
CARBONATE AS CO3	<0.00000	1990-91				5	1	
SULFATE (SO4)	35.00000-57.00000	1990-91	48.25000	9.42956	50.50000	4	0	20.71097-75.78903
CHLORIDE (CL)	<1.00000-3.00000	1990-91	1.12500	1.25000	1.00000	4	3	0.00000-4.77563
HYDROXIDE (OH)	0.00000	1991				1	0	

NUTRIENTS

AMMONIA (NH3 AS N)	<0.08000-0.18000	1990-91	0.10000	0.06164	0.09000	4	2	0.00000-0.28002
KJELDAHL NITROGEN AS N	<0.10000-1.40000	1990-91	0.60273	0.58066	0.47000	4	1	0.00000-2.29855
NITRATE + NITRITE AS N	<0.05000-0.06000	1990-91	0.05000	0.01750	0.05000	4	3	0.00000-0.10111
ORTHO-PHOSPHATE (PO4-P)	<0.01000-1.41000	1990-91	0.45263	0.66166	0.20000	4	1	0.00000-2.38501
PHOSPHORUS (P) (TOT)	0.02000-6.24000	1990-91	1.85500	2.95519	0.58000	4	0	0.00000-10.48563

CATION AND ANION BALANCE

SIGMA	1.30000-6.20000	1990	3.75000			2	0	
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TRACE ELEMENTS

ALUMINUM (AL) (DIS)	<0.10000-0.30000	1990-91	0.21896	0.06899	0.22000	4	1	0.01747-0.42045
ANTIMONY (SB) (DIS)	<0.05000	1990-91				3	3	
ARSENIC (AS) (DIS)	<0.00500-0.01200	1990-91	0.00500	0.00475	0.00500	4	3	0.00000-0.01887
BARIUM (BA) (DIS)	<0.10000	1990-91				4	4	
BERYLLIUM (BE) (DIS)	<0.00500	1990-91	0.00080			3	3	
CADMIUM (CD) (DIS)	<0.02000	1990-91				4	2	
CHROMIUM (CR) (DIS)	<0.00700-0.01400	1990-91	0.01000	0.00427	0.00850	4	2	0.00000-0.02247
COPPER (CU) (DIS)	0.08000-0.19000	1990-91	0.13250	0.05560	0.13000	4	0	0.00000-0.29488
IRON (FE) (DIS)	<0.00200-0.01000	1990-91	<0.00600			4	4	
LEAD (PB) (DIS)	<0.02000	1990-91				4	4	
MANGANESE (MN) (DIS)	<0.00010-0.00100	1990-91	<0.00055			4	4	
MERCURY (HG) (DIS)	<0.00500	1990-91				4	4	
MOLYBDENUM (MO) (DIS)	<0.03000-0.04000	1990-91	0.03000	0.01658	0.03000	3	2	0.00000-0.12501
NICKEL (NI) (DIS)	<0.00500	1990-91				4	4	
SELENIUM (SE) (DIS)	<0.00500	1991				1	1	
SELENIUM SE (TRC)	<0.00500	1990-91	0.00120			4	3	
SILVER (DIS)	<0.10000	1990-91				3	3	

ALL quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); NLT = number of below detection limit results.



Statistical Summary  
Site: SB-11A

TRACE ELEMENTS  
ZINC (ZN) (UIS)  
OTHER PARAMETERS  
CYANIDE (CN) (TOT)

Historical Data Range: Result Date	Mean	Standard Deviation	Median	Number of Samples N NLT	t-TEST for Mean 99% Confidence Interval
0.01000-0.03000 1990-91	0.01750	0.00957	0.01500	4 0	0.00000-0.04545
<0.00500 1990-91				4 4	

All quantities in mg/L unless otherwise noted. N - sample population (including detection limit data); NLT - number of below detection limit results. Robust log-probability regression used for mean and standard deviation estimate, adjusted lognormal maximum likelihood used for median for data with below detection limit results (USGS multiple detection limit algorithm). No statistics computed if 90% of data below detection limit.

Sample Type: Surface Water

SITE CODE	SW-1	SW-2	SW-2	SW-2	SW-2	SW-3	SW-3	SW-3	SW-3
SAMPLE DATE	09/25/91	06/05/91	07/09/91	08/13/91	09/24/91	03/15/91	06/05/91	07/09/91	07/09/91
LAB	CHEN	CHEN	CHEN	CHEN	CHEN	EL	CHEN	CHEN	CHEN
LAB NUMBER	120307	116351	117593	118933	120347	91-10198	116272	117565	117566
SAMPLE NUMBER	NNW-9109-126	NNW-9106-110	NNW-9107-111	NNW-9108-354	NNW-9109-114	NNW-9103-101	NNW-9106-101	NNW-9107-101	NNW-9107-102

-- PHYSICAL PARAMETERS --

EH (MILLIVOLTS) (FLD)	-022	-086	-065	-049	+174	+169	+161	+180
FLOW (cfs)	38.7	9.1	0.7	0.7	0.2	7.0	3.0	0.5
OXYGEN (O) (FLD)	8.3	7.5	7.2	8.6	14.2	11.5	10.9	8.7
PH (FLD)	7.3	8.55	7.96	8.26	2.79	3.46	2.91	3.24
PH	6.4	7.3	7.4	7.8	2.4	3.5	3.8	3.5
SC (UMHOS/CM @ 25 C) (FLD)	92.0	112.0	144.0	168.0	317.0	121.0	184.0	336.6
SC (UMHOS/CM @ 25 C)	97.0	110.0	166.0	171.0	318.0	125.0	215.0	376.0
STAFF GAGE (ft)	1.75	1.11	0.54			0.93	0.74	.52
TDS (@ 180 C)	45.0	69.0	91.0	121.0	173.0	54.0	100.0	187.0
TOTAL SUSPENDED SOLIDS	72.0	2.0	<2.0	<4.0	7.4	<10.0	16.0	4.0
TURBIDITY	4.2	0.65	0.3	0.25	7.4	6.7	17.0 J4	7.0
WATER TEMPERATURE (FLD)	0.5	9.5	16.4	7.0	1.4	1.5	7.5	10.4

-- COMMON IONS --

TOTAL HARDNESS AS CaCO3	267.0	<49.0	82.0	94.0	69.0	21.0	26.0	67.0
CALCIUM (CA) (DIS)	74.0	18.0	26.0	31.0	18.0	5.5	7.0	17.0
MAGNESIUM (MG) (DIS)	20.0	<1.0	4.0	4.0	6.0	1.7	2.0	6.0
SODIUM (NA) (DIS)	3.0	1.0	<1.0	<1.0	4.0	1.0	<1.0	3.0
POTASSIUM (K) (DIS)	1.0	<1.0	<1.0	<1.0	<1.0	0.6	<1.0	1.0
TOTAL ALKALINITY AS CaCO3	<1.0	44.0		63.0	<1.0	<1.0	<1.0	50.0
ACIDITY AS CaCO3	128.0				39.0	25.0	31.0	28.0
BICARBONATE (HCO3)	<1.0	54.0		77.0	<1.0	<1.0	<1.0	<1.0
CARBONATE AS O3	0.0	0.0		0.0	0.0	0.0	0.0	0.0
SULFATE (SO4)	367.0	12.0	19.0	21.0	115.0	36.0	58.0	118.0
CHLORIDE (CL)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HYDROXIDE (OH)	0.0			0.0				

-- NUTRIENTS --

AMMONIA (NH3 AS N)	<0.05 J2	0.1	0.06	<0.05	0.18 J2, UJ1	0.07	0.05	<0.05	0.05
KJELDAHL NITROGEN AS N	0.22	0.39	0.21	<0.2	0.52	0.31	<0.2	<0.2	<0.2
NITRATE + NITRITE AS N	0.09	0.11	<0.05	<0.05	0.66	0.07	<0.05	<0.05	<0.05
ORTHO-PHOSPHATE (PO4-P)	<0.02	0.07	<0.02	<0.02	<0.02 UJ1	0.02	0.02	0.02	<0.02
PHOSPHORUS (P) *TOT	<0.02	0.15	<0.02	<0.02	0.02 UJ1	0.03	0.04	0.03	<0.02

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAD - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
Blank line indicates parameter not tested.

Sample Type: Surface Water

		SW-1	SW-2	SW-2	SW-2	SW-2	SW-3	SW-3	SW-3	SW-3	SW-3
		SITE CODE	09/25/91	06/05/91	07/05/91	08/13/91	09/24/91	03/15/91	06/05/91	07/09/91	07/09/91
		LAB	CHEN	CHEN	CHEN	CHEN	CHEN	EL	CHEN	CHEN	CHEN
		LAB NUMBER	120307	116351	117393	118933	120347	91-10198	116272	117565	117566
		SAMPLE NUMBER	NW-9109-126	NW-9106-110	NW-9107-111	NW-9108-354	NW-9109-114	NW-9103-101	NW-9106-101	NW-9107-101	NW-9107-102
-- TRACE ELEMENTS --											
ALUMINUM (AL) *DIS		17.2									
ALUMINUM (AL) *TRC		18.0	1.9	<0.1	<0.1	<0.1	<0.1	2.7	1.1	1.46	1.62
ANTIMONY (SB) *DIS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ANTIMONY (SB) *TRC		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
ARSENIC (AS) *DIS		<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005
ARSENIC (AS) *TRC		<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005
BARIUM (BA) *DIS		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BARIUM (BA) *TRC		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BERYLLIUM (BE) *DIS		0.000	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BERYLLIUM (BE) *TRC		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
CADMIUM (CD) *DIS		0.0038	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	0.0001	0.0018 J4	0.0004
CADMIUM (CD) *TRC		0.0065	0.0001	<0.0001	<0.0001	0.0001	0.0002	<0.001	0.0001	0.0018 J4	0.0004
CHROMIUM (CR) *DIS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
CHROMIUM (CR) *TRC		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
COPPER (CU) *DIS		4.9	0.07 UJ1	0.027	0.009	0.009	0.007 UJ1	0.72	0.39	0.65	0.7
COPPER (CU) *TRC		5.1	0.07 UJ1	0.027	0.009	0.009	0.007 UJ1	0.72	0.39	0.65	0.7
IRON (FE) *DIS		4.66	3.35	0.06	0.05	0.05	<0.03	2.79	3.78	4.32	4.56
IRON (FE) *TRC		7.75	3.35	0.06	0.05	0.05	<0.03	2.79	3.78	4.32	4.56
LEAD (PB) *DIS		0.007	0.042	<0.002 J2	<0.001	<0.001	<0.002	<0.01		0.002 J2	<0.002 J2
LEAD (PB) *TRC		0.006	0.042	<0.002 J2	<0.001	<0.001	<0.002	<0.01		0.002 J2	<0.002 J2
MANGANESE (MN) *DIS		2.37	0.15	<0.02	<0.02	<0.02	<0.02	0.09	0.16	0.29	0.32
MANGANESE (MN) *TRC		2.65	0.15	<0.02	<0.02	<0.02	<0.02	0.09	0.16	0.29	0.32
MERCURY (HG) *DIS		<0.0001 J2	<0.0001	<0.0001 J2	<0.0003	<0.0003	<0.0001 J2, J	<0.001	<0.0001	<0.0001 J2	<0.0001 J2
MERCURY (HG) *TRC		<0.0001 J2	<0.0001	<0.0001 J2	0.0003	0.0003	<0.0001 J2	<0.001	<0.0001	<0.0001 J2	<0.0001 J2
MOLYBDENUM (MO) *DIS		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MOLYBDENUM (MO) *TRC		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
NIOBEL (NI) *DIS		0.05	<0.02	<0.03	<0.03	<0.03	<0.02		<0.02	<0.03	<0.03
NIOBEL (NI) *TRC		0.05	<0.02	<0.03	<0.03	<0.03	<0.02		<0.02	<0.03	<0.03
SELENIUM (SE) *DIS		<0.005	<0.005	<0.005 J2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 J2	<0.005 J2
SELENIUM (SE) *TRC		<0.005	<0.005	<0.005 J2	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 J2	<0.005 J2
SILVER (AG) *DIS		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005 UJ1	<0.005	0.0011	<0.0005	<0.0005
SILVER (AG) *TRC		0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.001 UJ1	<0.005	0.0011	<0.0005	<0.0005
THALLIUM (TL) *DIS		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAD - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (ELD).  
Blank line indicates parameter not tested.



SUMMARY OF WATER QUALITY ANALYSES  
NMA01 - Noranda New World - Nor NM Permit

Sample Type: Surface Water

SITE CODE SW-1  
SAMPLE DATE 09/25/91  
LAB CHEN  
LAB NUMBER 120307  
SAMPLE NUMBER NMA-9109-126

SW-2	SW-2	SW-2	SW-2	SW-2	SW-3	SW-3	SW-3	SW-3	SW-3
06/05/91	07/09/91	08/13/91	09/24/91	03/15/91	06/05/91	07/09/91	07/09/91	07/09/91	08/14/91
CHEN	CHEN	CHEN	CHEN	EL	CHEN	CHEN	CHEN	CHEN	CHEN
116351	117593	118933	120347	91-10198	116272	117565	117566	117566	110910
NMA-9106-110	NMA-9107-111	NMA-9108-354	NMA-9109-114	NMA-9103-101	NMA-9106-101	NMA-9107-101	NMA-9107-102	NMA-9108-309	

-- TRACE ELEMENTS --

THALLIUM (TL) \*TRC <0.1  
ZINC (ZN) \*DIS 0.71  
ZINC (ZN) \*TRC 0.79

-- OTHER PARAMETERS --

CYANIDE (CN) \*TOT <0.005

- \* DIS - Dissolved
- \* FRE - Free
- \* TOT - Total
- \* TRC - Total Recoverable
- \* WAD - Weak Acid Dissociable

All quantities in mg/L (Water) or mg/kg (Soil) unless otherwise noted. All results are LABORATORY unless otherwise specified as field (FLD).  
Blank line indicates parameter not tested.

Statistical Summary  
Site: SW-3

t-TEST for Mean  
99% Confidence Interval

Number of  
Samples  
N NLT

Standard  
Deviation

Mean

Historical Data Range:  
Result Date

PHYSICAL PARAMETERS

FLOW (CFS)	0.20000-17.89000	1989-91	5.37960	5.98081	3.20000	25	0	2.03393-8.72527
OXYGEN (O) (field)	6.40000-14.20000	1990-91	10.03667	2.23706	9.40000	15	0	8.31714-11.75620
PH (field)	2.79000-6.56000	1989-91	3.45142	1.01249	3.46000	15	0	2.67316-4.22968
PH	2.40000-4.00000	1989-91	3.34669	0.32683	3.60000	20	0	3.13760-3.55578
SC (UMHOS/CM @ 25 C) (field)	90.00000-474.00000	1989-91	210.46750	115.98320	166.54000	20	0	136.26052-284.66648
SC (UMHOS/CM @ 25 C)	102.00000-483.00000	1989-91	275.15000	117.76170	265.00000	20	0	199.81324-350.48676
STAFF GAGE (FT)	0.51000-1.18000	1989-91	0.81400	0.21409	0.80000	20	0	0.67704-0.95096
TDS - CALCULATED	43.00000-425.00000	1989-90	176.50000			8	0	
TDS (@ 180 C)	44.00000-248.00000	1989-91	130.85000	60.51818	116.00000	20	0	92.13416-169.56584
TOTAL SUSPENDED SOLIDS	<2.00000-124.00000	1989-91	16.01812	25.79847	8.24973	25	2	1.58646-30.44978
TURBIDITY (field)	0.40000-72.00000	1990	10.72385			13	0	
TURBIDITY	0.98000-42.00000	1989-91	11.31920	8.01013	9.20000	25	0	6.83833-15.80007
WATER TEMPERATURE (field)	1.00000-12.10000	1989-91	4.88333	3.59307	3.80000	24	0	2.82459-6.94207

COMMON IONS

TOTAL HARDNESS AS CaCO3	17.00000-87.00000	1989-91	61.08333	24.79904	68.00000	12	0	38.84789-83.31877
CALCIUM (CA) (DIS)	5.00000-23.00000	1989-91	16.12500	6.42483	17.50000	12	0	10.36434-21.88566
MAGNESIUM (MG) (DIS)	1.00000-7.00000	1989-91	4.97500	2.17177	6.00000	12	0	3.02774-6.92226
SODIUM (NA) (DIS)	<1.00000-5.00000	1989-91	2.89190	1.54146	3.00000	12	1	1.50979-4.27401
POTASSIUM (K) (DIS)	<0.60000-2.00000	1991	1.04087	0.66929	0.94181	4	1	0.00000-2.99553
TOTAL ALKALINITY AS CaCO3	<0.00000-1.00000	1989-91	0.00000			19	11	
ACIDITY AS CaCO3 (field)	56.30000	1989				1	0	
ACIDITY AS CaCO3	22.00000-1250.00000	1989-91	102.56320	278.09230	38.90000	19	0	0.00000-286.17600
BICARBONATE (HCO3)	<1.00000	1989-91				11	11	
CARBONATE AS CO3	0.00000	1989-91				11	0	
SULFATE (SO4)	35.00000-153.00000	1989-91	87.00000	40.03157	80.00000	20	0	61.39024-112.60976
CHLORIDE (CL)	<1.00000	1989-91				12	11	
HYDROXIDE (OH)	0.00000	1991				1	0	

NUTRIENTS

AMMONIA (NH3 AS N)	<0.05000-0.10000	1989-91	0.06000			18	16	
KJELDAHL NITROGEN AS N	<0.10000-0.40000	1989-91	0.13319	0.12172	0.05047	11	8	0.01689-0.24949
NITRATE + NITRITE AS N	<0.05000-0.09000	1989-91	0.06166	0.01354	0.06000	18	7	0.05241-0.07091
ORTHO-PHOSPHATE (PO4-P)	<0.01000-0.10000	1989-91	0.00770	0.00615	0.00699	12	9	0.00219-0.01321
PHOSPHORUS (P) (TOT)	<0.01000-0.12000	1989-91	0.03741	0.08945	0.01329	12	5	0.00000-0.11761

CATION AND ANION BALANCE

STGMA	0.00000-0.78000	1989-90	0.09750	0.27577	0.00000	8	0	0.00000-0.43865
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TRACE ELEMENTS

ALUMINUM (AL) (DIS)	2.60000-4.00000	1990-91	3.30000			2	0	
ALUMINUM (AL) (TRC)	<0.10000-4.30000	1989-91	2.41466	0.91185	2.20000	19	1	1.81260-3.01672
ANTIMONY (SB) (DIS)	<0.05000	1991				1	1	
ANTIMONY (SB) (TRC)	<0.05000	1990-91				5	5	
ARSENIC (AS) (DIS)	<0.00500	1990-91				2	2	
ARSENIC (AS) (TRC)	<0.00100-0.00500	1989-91	<0.00469			13	13	
BARIUM (BA) (DIS)	<0.10000	1990-91				2	2	
BARIUM (BA) (TRC)	<0.10000	1990-91				12	12	
BERYLLIUM (BE) (DIS)	<0.00500	1991				1	1	
BERYLLIUM (BE) (TRC)	<0.00500	1990-91				5	5	
CADMIUM (CD) (DIS)	0.00040-0.00080	1990-91	0.00060			2	0	
CADMIUM (CD) (TRC)	<0.00010-0.00220	1989-91	0.00062	0.00064	0.00038	16	8	0.00015-0.00109
CHROMIUM (CR) (DIS)	<0.02000	1990-91				2	2	
CHROMIUM (CR) (TRC)	<0.02000	1990-91				12	11	0.01741-0.02259
COPPER (CU) (DIS)	0.93000-0.97000	1990-91	0.95000	0.00289	0.02000	2	0	

All quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); NLT = number of below detection limit results. Robust log-probability regression used for mean and standard deviation estimate, adjusted lognormal maximum likelihood used for median for data with below detection limit results (USGS multiple detection limit algorithm). No statistics computed if 90% of data below detection limit.

Statistical Summary  
Site: SW-3

TRACE ELEMENTS

	Historical Data Range: Result Date	Mean	Standard Deviation	Median	Number of Samples N NLT	t-TEST for Mean 99% Confidence Interval
COPPER (CU) (TRC)	0.03000-1.04000 1989-91	0.67147	0.27149	0.61000	19 0	0.492222-0.85072
IRON (FE) (DIS)	4.86000-5.19000 1990-91	5.02500			2 0	
IRON (FE) (TRC)	<0.03000-6.98000 1989-91	4.04649	1.88914	3.79000	19 1	2.79917-5.29381
LEAD (PB) (DIS)	<0.00200-0.00500 1990-91	0.00350			2 1	
LEAD (PB) (TRC)	<0.00300-0.01000 1989-91	0.00451	0.00156	0.00425	15 9	0.00331-0.00571
MANGANESE (MN) (DIS)	0.54000-1.26000 1990-91	0.90000			2 0	
MANGANESE (MN) (TRC)	0.11000-1.29000 1989-91	0.68125	0.45494	0.72500	16 0	0.34607-1.01643
MERCURY (HG) (DIS)	<0.00010 1990-91				2 2	
MERCURY (HG) (TRC)	<0.00010-0.00100 1989-91	0.00030			13 12	
MOLYBDENUM (MO) (DIS)	<0.00500 1990-91				2 2	
MOLYBDENUM (MO) (TRC)	<0.00500 1989-91				15 15	
NICKEL (NI) (DIS)	<0.02000 1991				1 1	
NICKEL (NI) (TRC)	<0.02000-0.04000 1990-91	0.02500	0.01255	0.03000	5 4	0.00000-0.05084
SELENIUM (SE) (DIS)	<0.00500 1990-91				2 2	
SELENIUM (SE) (TRC)	<0.00500 1989-91				12 12	
SILVER (AG) (DIS)	<0.00050 1990-91				2 2	
SILVER (AG) (TRC)	<0.00050-0.00500 1989-91	0.00080			16 14	
THALLIUM (TL) (DIS)	<0.10000 1991				1 1	
THALLIUM (TL) (TRC)	<0.10000 1990-91				5 5	
ZINC (ZN) (DIS)	0.16000-0.22000 1990-91	0.19000			2 0	
ZINC (ZN) (TRC)	0.01000-0.22000 1989-91	0.10474	0.06204	0.11000	19 0	0.06378-0.14570

OTHER PARAMETERS

CYANIDE (CN) (TOT)	<0.00500-0.01000 1989-91	0.00500			11 10	
OIL & GREASE	<1.00000 1989-90				3 3	

All quantities in mg/L unless otherwise noted. N = sample population (including detection limit data); NLT = number of below detection limit results. Robust log-probability regression used for mean and standard deviation estimate, adjusted lognormal maximum likelihood used for median for data with below detection limit results (USGS multiple detection limit algorithm). Statistics computed if 90% of data below detection limit.

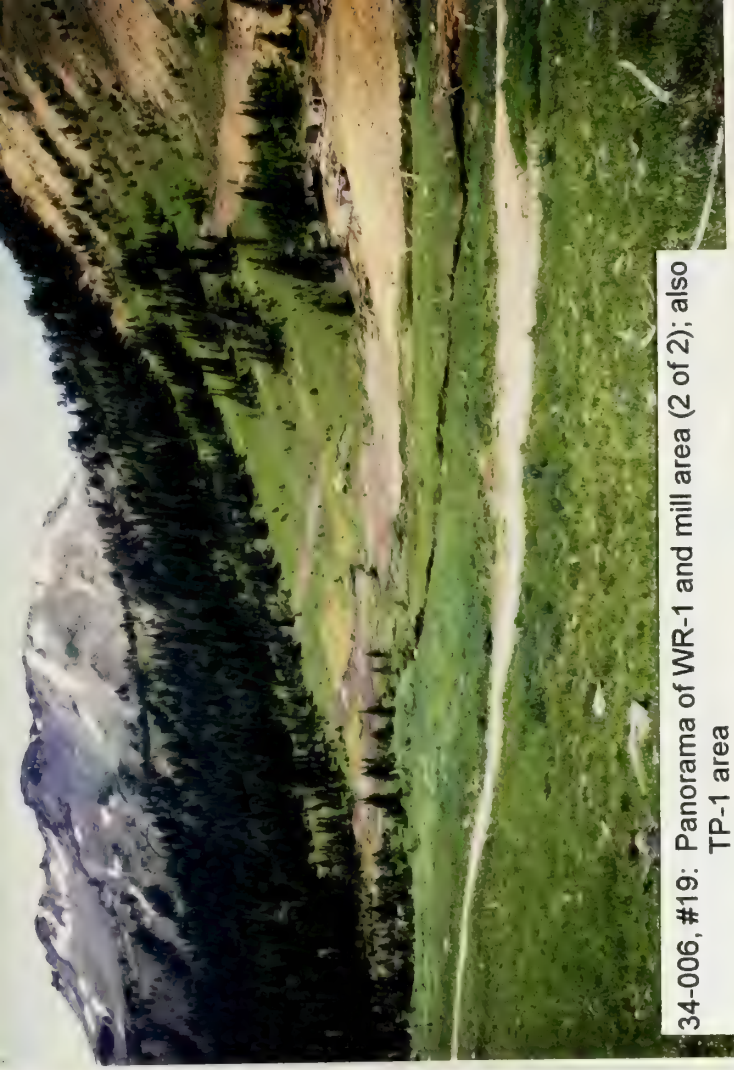








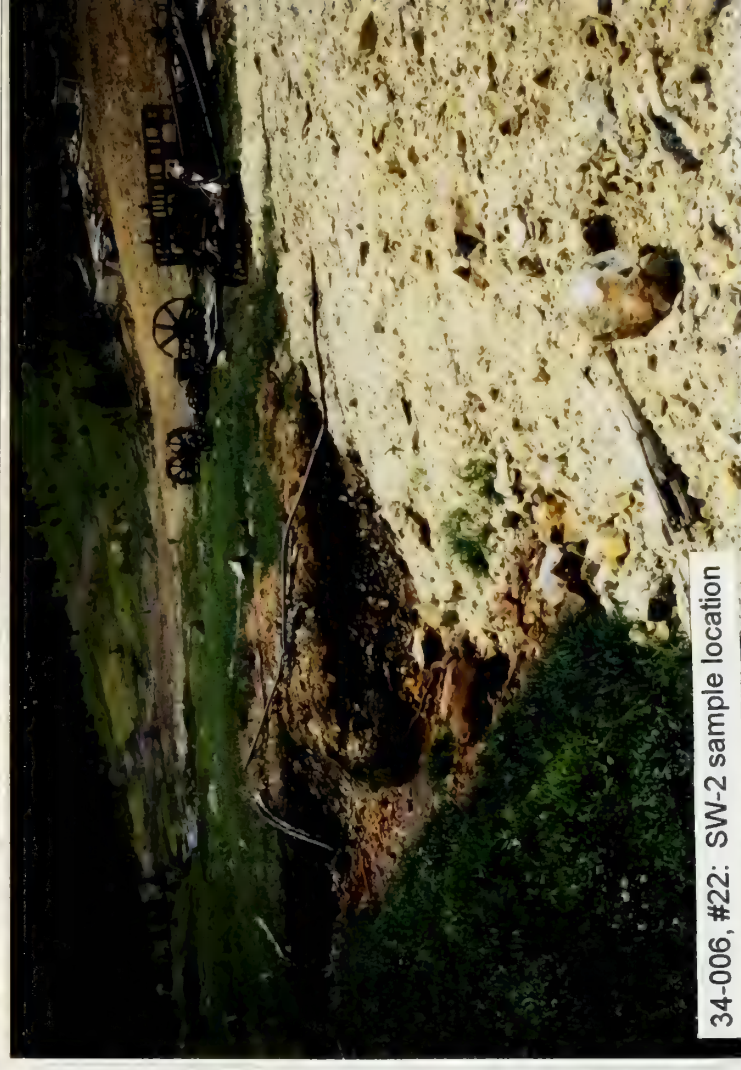
34-006, #18: Panorama of WR-1 and mill area (1 of 2)



34-006, #19: Panorama of WR-1 and mill area (2 of 2); also TP-1 area

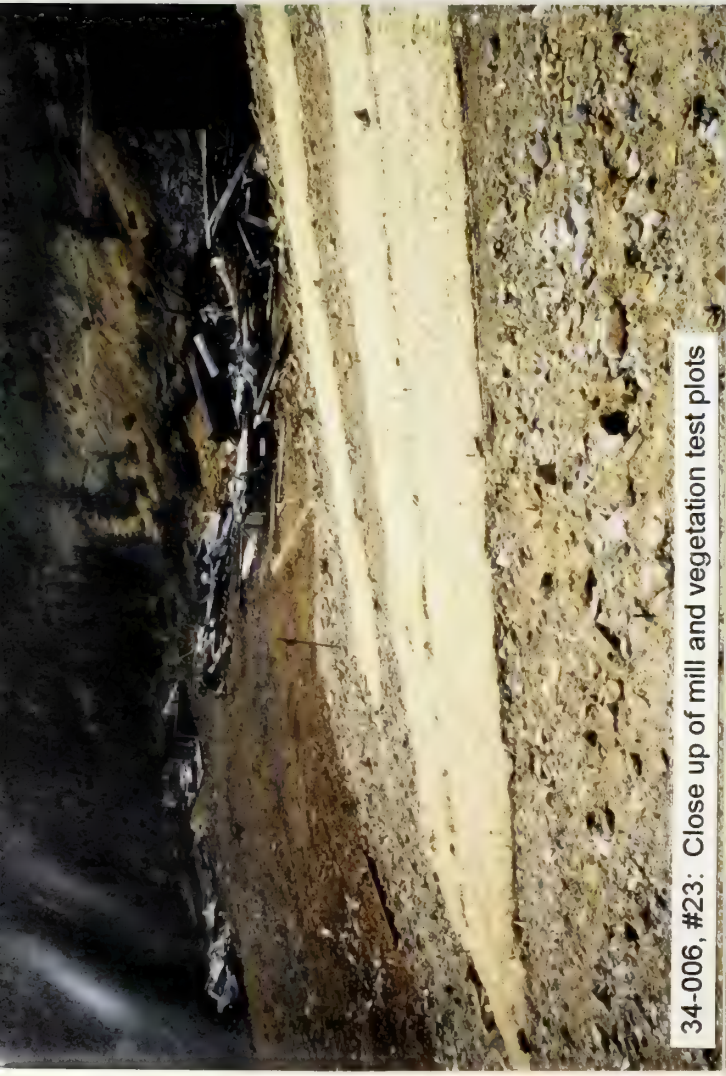


34-006, #21: WR-2



34-006, #22: SW-2 sample location

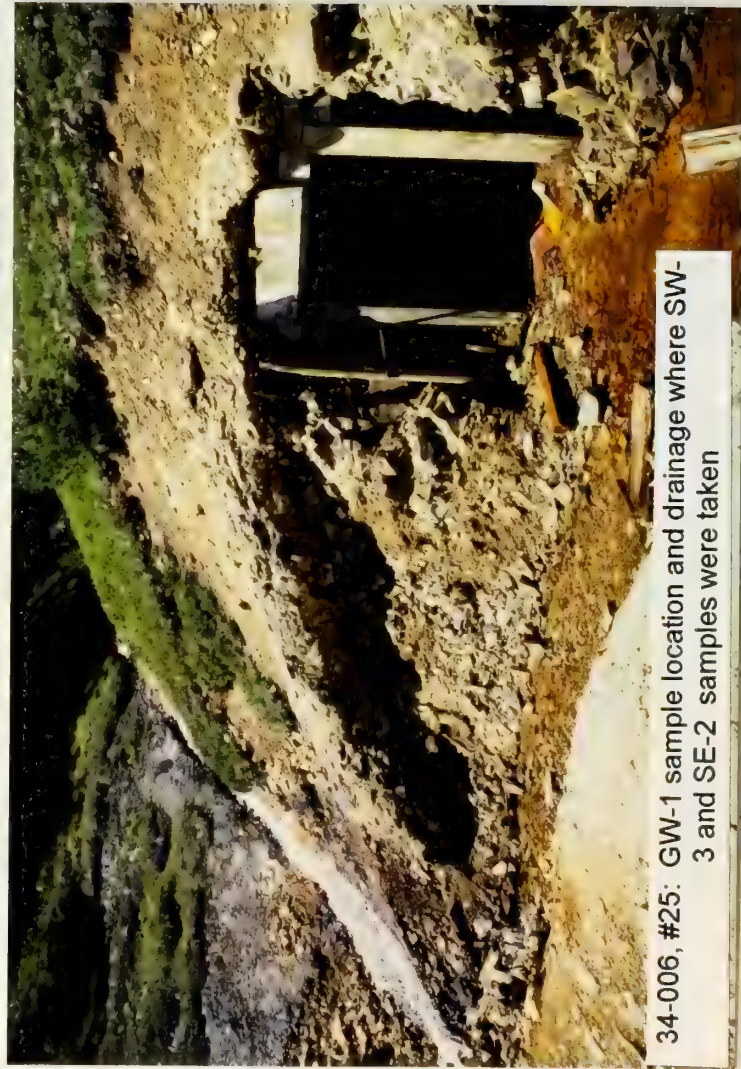




34-006, #23: Close up of mill and vegetation test plots



34-006, #24: GW-2 sample location



34-006, #25: GW-1 sample location and drainage where SW-3 and SE-2 samples were taken



34-006, #26: SW-4 and SE-3 sample locations





34-006, #27: SW-1 and SE-1 sample locations downgradient of site on Fisher Creek



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: GOLD DUST PA#: 34-007

Date: August 9, 1993 Time: 1400-1715

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Clark, Pioneerr

Visitors: Earl McCurley, MDSL

Weather/Seasonality Observations: Sunny; warm; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #28: SW-1 sample location; #29: Discharge from WR-1 (under loadout going to creek); #30: Adit discharge (GW-1) and adit; #31: SW-2 sample location; #5: WR-1, facing south; #9: WR-1, facing north. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site was gained by truck. New development of adit since 1990.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study water treatment requirements. Reclamation requirements depend on whether Crown Butte Mines, Inc., is granted a permit and initiates active mining from this site.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): GOLD DUST PA#: 34-007

Legal Description: T 9S ; R 14E ; Sec. 11 , SE1/4 SE1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 04' 01" Longitude: W 109° 56' 33"

Primary Drainage Basin and Code: Clark Fork Yellowstone/10070006

Secondary Drainage Basin: Fisher Creek

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active X , Inactive/Exploration      , Abandoned      .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Crown Butte  
Mines, Inc., Petroleum Building, Suite 510, 2812 1st Avenue N,  
Billings, MT 59101. (406) 245-3455; Margaret Reeb, Trustee, P.O.  
Box 301, Livingston, MT 59047. (406) 222-6739; Gallatin National  
Forest.

Relationship to other mines/sites in the area/district: Near  
Homestake Mine and is now a possible New World development.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Adit has been fenced by Crown Butte;  
active exploration/development in progress. Site is within Crown  
Butte's proposed permit area.

General site features: Elevation 9200' , Slope 21° ,  
Aspect East

Land use: Mining X , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 1.5 acres.  
Dimensions:     

Predominant vegetation types: White bark pine, Subalpine fir,  
Lodgepole pine, grasses, unidentified shrubs

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 16 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Deposit is of the contact metamorphic  
type. A xenolith of Gros Ventre limestone enclosed and partly  
invaded by monzonite porphyry has been highly altered and  
mineralized along a complex fracture network. Site lies in  
headwaters of perennial Fisher Creek on the southwest side. Water  
from the site would flow to northeast. Fisher Creek flows  
southeast away from site to confluence with Clark Fork of  
Yellowstone River 3 1/4 miles away.

Mining/milling history, ore type/tenor, host rock, gangue:   
Predominant ore minerals are chalcopyrite and auriferous pyrite  
with oxides of copper, iron, and manganese. The limestone gangue  
is silicified and highly altered.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment Inaccessable (fenced)  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

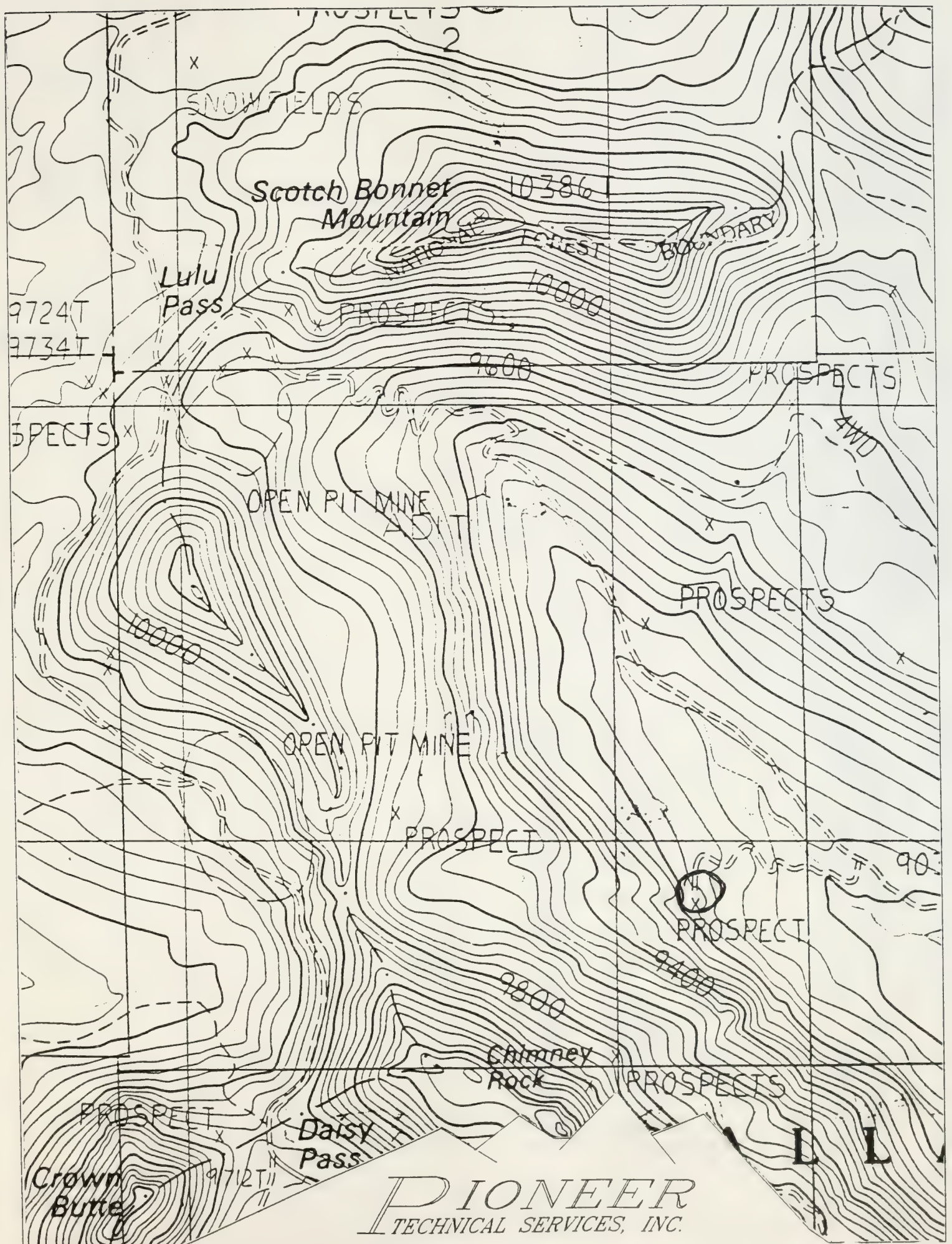


Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:8245	09S 14E 02	0.0	0.0	1.50
M:8247	09S 14E 02 CC	0.0	0.0	4.60
M:8248	09S 14E 02 CCD	0.0	0.0	3.30
M:8249	09S 14E 02 CCD	0.0	0.0	4.70
M:121504	09S 14E 03 D	17.0	0.0	0.00
M:121503	09S 14E 03 D	22.0	0.0	0.00
M:121501	09S 14E 03 D	25.0	0.0	0.00
M:121502	09S 14E 03 D	20.5	0.0	0.00
M:130282	09S 14E 11 A	37.0	0.0	0.00
M:130283	09S 14E 11 A	60.0	0.0	0.00
M:8279	09S 14E 11 CB	0.0	0.0	11.60
M:130288	09S 14E 11 D	71.5	0.0	0.00
M:130284	09S 14E 11 D	45.5	0.0	0.00
M:130287	09S 14E 11 D	30.0	0.0	0.00
M:130290	09S 14E 11 D	12.5	0.0	0.00
M:130292	09S 14E 12 C	28.3	0.0	0.00





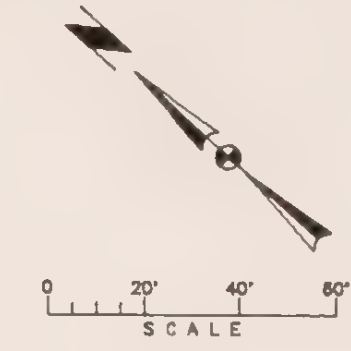
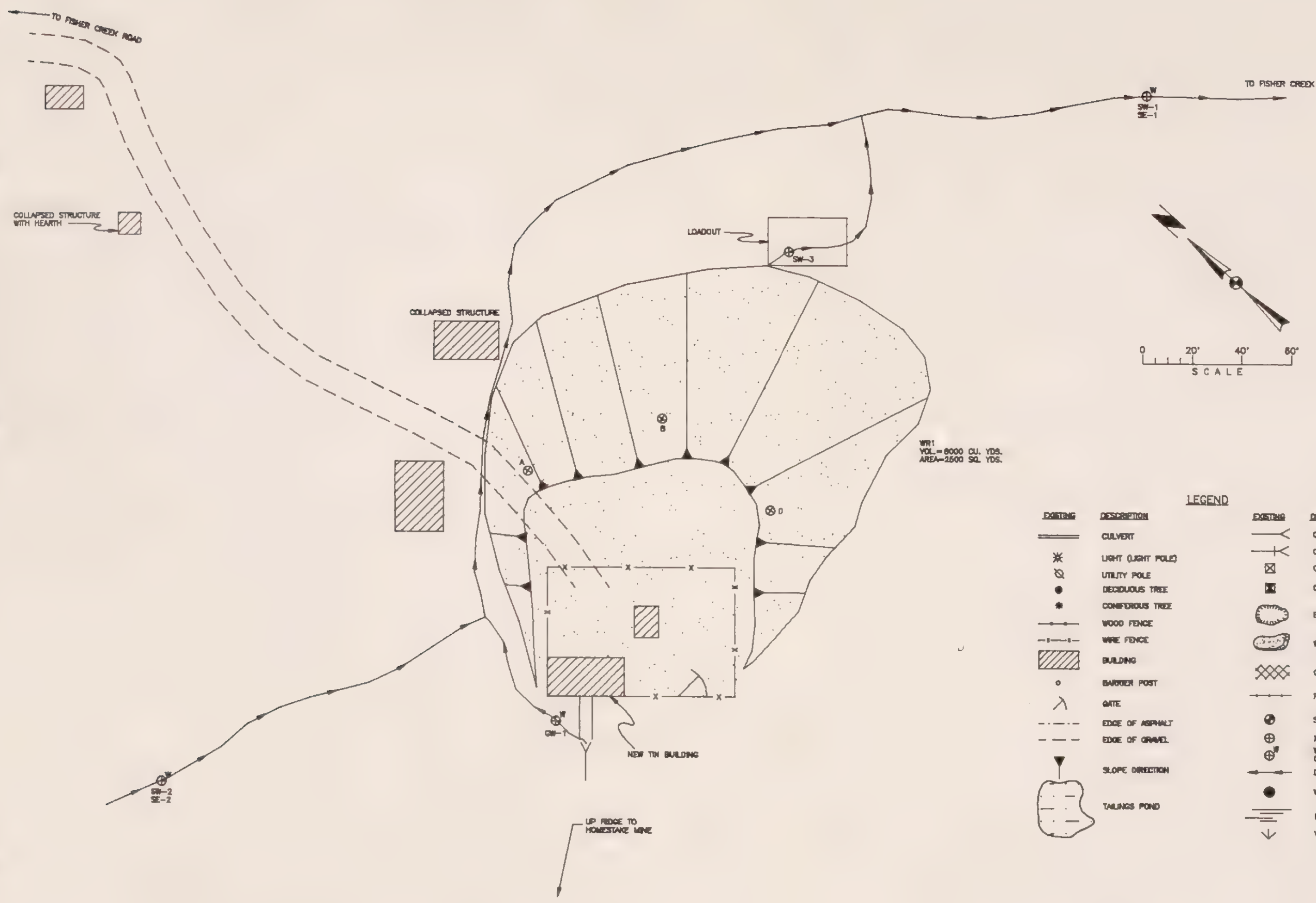
GOLD DUST, P.A. NO. 34-007

T09S, R14E, SECTION 11

SCALE: 1" = 1000'







EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WASTE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARRIER POST		SOIL SAMPLE
	GATE		XRF SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE
	EDGE OF GRAVEL		GROUND AND SURFACE DRAINAGE
	SLOPE DIRECTION		WATER WELL
	TAILINGS POND		PONDED WATER
			VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

GOLD DUST PA# 34-007

NEW WORLD DISTRICT PARK COUNTY

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA  
SPokane WASHINGTON

DATE 15 NOV 93  
JOB NO. 93-17  
F.B. NO.

DRAWN JTP  
DESIGNED JPR  
APPROVED HJB





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A



**SAMPLERS:** Bullock

[illegible]

P-Direct Feeding (Keweenaw Meteor), 8-Saturated Paste (Orion Meteor)

**Comments or deviations from SOPs:** 34-007-WR-1 is a composite of WR-1A and WR-1D. 34-007-WR-2 is a composite of WR-1B and WR-1C.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Discharge from adit associated with WR-1 flows into stream.

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes     , No X, Number:      Identification:     

Groundwater wells within 4 miles?: Yes X, No     ;  
Number of well logs: 113

Distance to nearest well used for drinking? 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable     , Possible X, Unlikely     .

Possible due to water in contact with highly mineralized ore body.

Other observations/notes: N/A

**SAMPLERS:** Belanger

[illegible]

Flow: Estimated (E) or Measured (M) from edit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No    , Name(s): Unnamed tributary to Fisher Creek

Dry streambeds: Yes    , No X, Name(s):                     

Other surface water: Yes    , No X, Name(s)/Description:                     

Waste materials within any floodplain: Yes X, No     Source ID(s): Waste rock

Approximate Flood frequency? X 1 yr,     10 yr,     100 yr

Estimated seasonal flow of stream(s) (cfs)? 1.5 during investigation  
High Flow: 10 cfs, Average Flow: 1.0 cfs

Distance between waste source(s) and nearest surface water body (ft)? Adit discharge flows over and off dump, while the stream is approximately 20 feet from dump.

Surface water draining onto or through waste sources: Yes X, No    ,  
Describe: Adit discharge flows over dump.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Stream discharges into Fisher Creek which flows into the Clark Fork Yellowstone River; recreation, fishery, wilderness within Yellowstone National Park, T&E - Grizzly and Bald Eagle habitat and possible Gray Wolf habitat.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No    , Distance downstream (ft)? 500 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Staining and sedimentation to confluence with Fisher Creek for approx. 500 feet.



**SAMPLERS:** Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

 Comments or Deviations from the SOPs (Pioneer SAP, 1993): | NM = Not Measured |

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 4 acres of moderately open terrain

Wetlands present: Yes X, No    , Describe: Wetlands associated with the creek below the site.

Carbonate rocks/soils: Yes X, No    , Describe: Host rock is described as Gros Ventre limestone.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10    ; 10-30    ; 30-100    ; 100-300 X; 300-1,000    ; 1,000-3,000    ; 3,000-10,000    ; 10,000 or greater    ; Comments    

Nearest residence(ft or miles)? 2.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS:** Bullock, Belanger

[illegible]

## Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Lots of  
tourists and off-road vehicle rides

Accessibility - Fences, warning signs, closed roads? Unrestricted to  
the site; adit is fenced off.

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u>X</u> , No____, Comment <u>Yellowstone</u>
Wilderness Area -	Yes <u>X</u> , No____, Comment <u>Absaroka/Beartooth</u>
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Bald Eagle</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium____, Low <u>X</u>
Fisheries Habitat and Species Classification -	<u>6</u>
Sport Fishery Classification -	<u>6</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
Adit recently developed.

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Wooden loadout structure

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes X, No\_\_\_\_, Explain: Wooden loadout  
possible explosives storage in new mine buildings.

## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Park County, Montana, Information Circular 7546, Written by Glenn C. Reed, February 1950.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/WQB, Analytical Data for Gold Dust, September 25, 1979.

MDSL/AMRB, Environmental Assessment Analytical Data for Gold Dust, Prepared by MSE, Inc., October 4 and 29, 1990.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Gold Dust, Prepared by Mark Carlstrom and Ben Mundie, September 25, 1979.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Gold Dust, Prepared by Chen-Northern, August 23, 1989.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1989.





LABORATORY ANALYTICAL DATA

GOLD DUST  
PA NO. 34-007



Gold Dust PA# 34-007  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-007-SE-1	20.2 J	76.8	1.3	12.8 J	19.7	378	33200	0.064 J	835 J	25.9	245 J	6.51 U	403	NR
34-007-SE-2	19.1 J	48.3	1.9	24.1 J	11.4	547	23500	0.013 J	1580 J	33.8	309 J	8.13 U	472	NR
34-007-WR-1	40.3 J	85.8	0.8	4.2 J	14.1	180	47600	1.15 J	157 J	8.74	68.2 J	5.93 U	66.1	NR
34-007-WR-2	34.9 J	56.9	0.5 U	10.6 J	20.4	98.4	30500	0.256 J	339 J	24.8	51.2 J	5.45 U	83.3	NR
BACKGROUND	8.61 J	71.7	0.9	12.4 J	27	66.9	17100	0.019 J	461 J	23.9	28.3 J	5.49 U	69.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000
34-007-WR-1	0.27	8.43	0.35	-8.08	0.12	-8.08	0.11	1.25	0.11	1.25	0.04	0.04	-0.90	-0.90
34-007-WR-2	4.67	146	61.6	-84.3	<0.01	-84.3	2.83	64.4	2.83	64.4	2.06	2.06	-2.76	-2.76

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
34-007-GW-1	3.06	16.9	2.57 U	9.7 U	6.83 U	6.53 JX	144 JX	0.11 J	55.7	13.5 J	2.17	30.7 U	11.1	381
34-007-SW-1	1.81	38.4	2.57 U	9.7 U	6.83 U	11.4 JX	58.7 JX	0.06 J	13	15 J	2.9	30.7 U	70	152
34-007-SW-2	1.39	38	2.57 U	9.7 U	6.83 U	11.5 JX	40 JX	0.1 J	11.3	12.7 U	3.58	30.7 U	96.1	138

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
34-007-GW-1	581	< 5.0	282	0.07	NR
34-007-SW-1	256	< 5.0	117	0.06	NR
34-007-SW-2	231	< 5.0	109	0.18	NR

LEGEND

SE1 - Downgradient of site in unnamed stream.  
SE2 - Upgradient of site in unnamed stream.  
WR1 - Composite of samples WR1A and 1D.  
WR2 - Composite of samples WR1B and 1C.  
BACKGROUND - From the Lower Glangarry (34-006-SS-1).

GW1 - Discharge from adit.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.





XRF ANALYSIS RESULTS

GOLD DUST  
PA NO. 34-007





**Mine Name: Gold Dust PA# 34-007**

## XRF Field Analyses

## Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-007-WR1-A		36076.7	2138.76	2202.93		285.448 *	42013.4	436.953 *		48.2509 *	74.8842 *	133.432
34-007-WR1-B		33614.5	14767.3	1777.51		845.083 *	33199.5		79.7878 *	110.19 *	46.1777 *	310.778
34-007-WR1-C		38125.6	20536.2	1852.39		701.883 *	28269.4		80.8585 *	92.5469 *	30.1591 *	360.633
34-007-WR1-C-DUP		32648.2	16772.3	1425.13	359.224 *	625.762 *	23675		46.3459 *	86.3813 *	31.5115 *	309.963
34-007-WR1-D		24903.4	7529.62	2325		1077.91 *	101028	681.315 *	409.597	218.421	67.0044 *	193.109
34-007-WR-1-COMP		26581.8	3538.3	2107.73		736.328 *	61811		176.395 *	83.0922 *	74.8176 *	152.332
34-007-WR-2-COMP		30539.9	14946	1937.63		869.973 *	34401.1		100.309 *	126.633 *	36.0723 *	294.793
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
34-007-WR1-A	151.472				193.652			1474.45			19.0122 *	
34-007-WR1-B	123.116				163.153			1777.8			20.4395	
34-007-WR1-C	131.447				177.154			1843.33			21.4646	
34-007-WR1-C-DUP	106.684				169.62			1489.31			21.7806	
34-007-WR1-D	150.432		45.2153	50.7151 *	136.408			989.958			22.5251	
34-007-WR-1-COMP	184.327		13.0078 *	30.4228 *	166.434			1094.72			22.5073	
34-007-WR-2-COMP	128.899				156.406			1623.35	106.873 *		21.227	

★ - Estimated Quantity

**\$ - Unvalidated Data**



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

GOLD DUST  
PA NO. 34-007





# AIMSS SCORESHEET

SITE NAME:  
PA NUMBER:

GOLD DUST  
34-007

LINE NO.		GROUNDWATER PATHWAY	PA NUMBER:	34-007
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	40
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	40
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.171
6		WELLS - 1 MI. x 2.5		40.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		97
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	137.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	11897
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.330
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19	SW - TARGETS	FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	21
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	34251
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.002
29		POPULATION - 4 MILES		100
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		10
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	115
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	12
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.001
40		POPULATION - 1 MILE		0
41	DIRECT CONTACT TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 THRU 42	10
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	2
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			0.46

LINE NO.			SITE NAME:	GOLD DUST
			PA NUMBER:	34-007
	<b>SITE SAFETY</b>			
1	THREAT	ACCESSIBILITY		20
2	HAZARDS	OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4		UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		50
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	140
9	TARGETS	POPULATION - 1 MILE		0
10		NEAREST RESIDENCE		0
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	10
13	<b>SITE SAFETY SCORE</b>		(LINES 1 x 8 x 12) / 1,000	<b>28.00</b>



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

HELENA, MONTANA 59601

SAMPLE DEPTH BELOW SURFACE

SAMPLING SITE: GOLD DUST MINE MINE DRAINAGE

NO3+NO2 (TOT AS N)

0.000

SODIUM ADSORPTION RATIO

### ADDITIONAL PARAMETERS

 $< 0.2$ 

MARKS: A M L

)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

100 mg/kg/day. Ingested solvent was excreted in the urine and feces. The excretion of solvent in the urine was 100% within 24 h. The excretion of solvent in the feces was 100% within 48 h. The excretion of solvent in the urine was 100% within 24 h. The excretion of solvent in the feces was 100% within 48 h.

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Gold Dust Mine below Dump

LAB NO: W8584

DATE RECEIVED: 09-14-90

Hardness 154 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As <0.001 mg/L

Cd <0.0001 mg/L

Cu <0.01 mg/L

Fe 0.11 mg/L

Pb <0.001 mg/L

Zn 0.08 mg/L



DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Gold Dust Dump--09/07/90

LAB NO: S2692

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.24 SU

Total Metals

As 252 mg/Kg

Cd 25 mg/Kg

Cu 47 mg/Kg

Fe 124.000 mg/Kg

Pb 68 mg/Kg

Zn 45 mg/Kg





34-007, #5: WR-1, facing south



34-007, #6: WR-1, facing north



34-007, #28: SW-1 and SE-1 sample locations



34-007, #29: Discharge from WR-1 (under loadout) going into creek





34-007, #31: SW-2 and SE-2 sample locations



34-007, #30: Adit discharge; GW-1 sample location



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: LITTLE DAISY PA#: 34-009

Date: August 9, 1993 Time: 0720

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Warm (up to 65°); partly cloudy;  
breezy (10 to 15 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #15: WR-2 and WR-1  
in background. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms):  
Site has stone foundation that was suspected to be a mill  
foundation; however, no tailings were detected.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Contour,  
amend, coversoil, and revegetate lower areas or reprocess for iron.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): LITTLE DAISY PA#: 34-009

Legal Description: T 9S ; R 14E ; Sec. 14 , NW1/4 NW1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 03' 10" Longitude: W 109° 57' 09"

Primary Drainage Basin and Code: Soda Butte Creek/10070001

Secondary Drainage Basin: Miller Creek

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Zinc, Lead

Activity Status: Active      , Inactive/Exploration X , Abandoned      .

Ownership status: Known YX N ; private/public? Private/Public

Owner, Agent, or Contact (Include address and phone when available): Margaret Reeb,  
Trustee, P.O. Box 301, Livingston, MT 59047. (406) 222-6739;  
Gallatin National Forest.

Relationship to other mines/sites in the area/district: The McLaren Mine is north on the Daisy Pass Road.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Exploration permit by Crown Butte;  
some grading has been done with possible seeding.

General site features: Elevation 9800' , Slope Up to 37° ,  
Aspect South

Land use: Mining X , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 0.6 acres.  
Dimensions:     

Predominant vegetation types: Grasses, pines

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 8 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). An unnamed tributary to Miller Creek has  
its headwaters south of the site and flows south past WR-6 and away  
from the site. The site has andesite intrusive float on the dumps.

Mining/milling history, ore type/tenor, host rock, gangue: No  
information available.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 4, Comment Caved  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

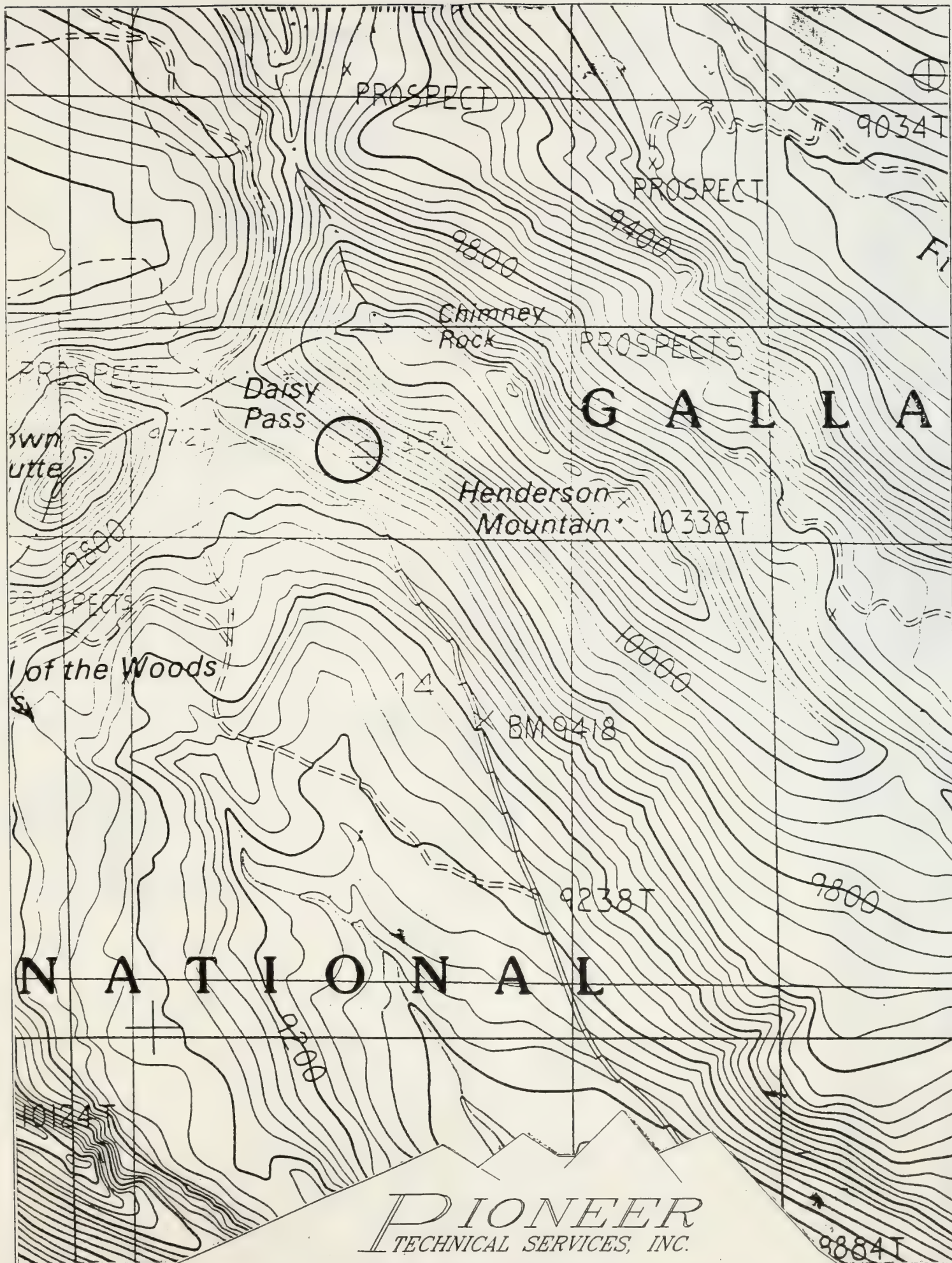
Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:130282	09S 14E 11 A	37.0	0.0	0.00
M:130283	09S 14E 11 A	60.0	0.0	0.00
M:8279	09S 14E 11 CB	0.0	0.0	11.60
M:130288	09S 14E 11 D	71.5	0.0	0.00
M:130284	09S 14E 11 D	45.5	0.0	0.00
M:130287	09S 14E 11 D	30.0	0.0	0.00
M:130290	09S 14E 11 D	12.5	0.0	0.00
M:130292	09S 14E 12 C	28.3	0.0	0.00







*PIONEER*  
TECHNICAL SERVICES, INC.

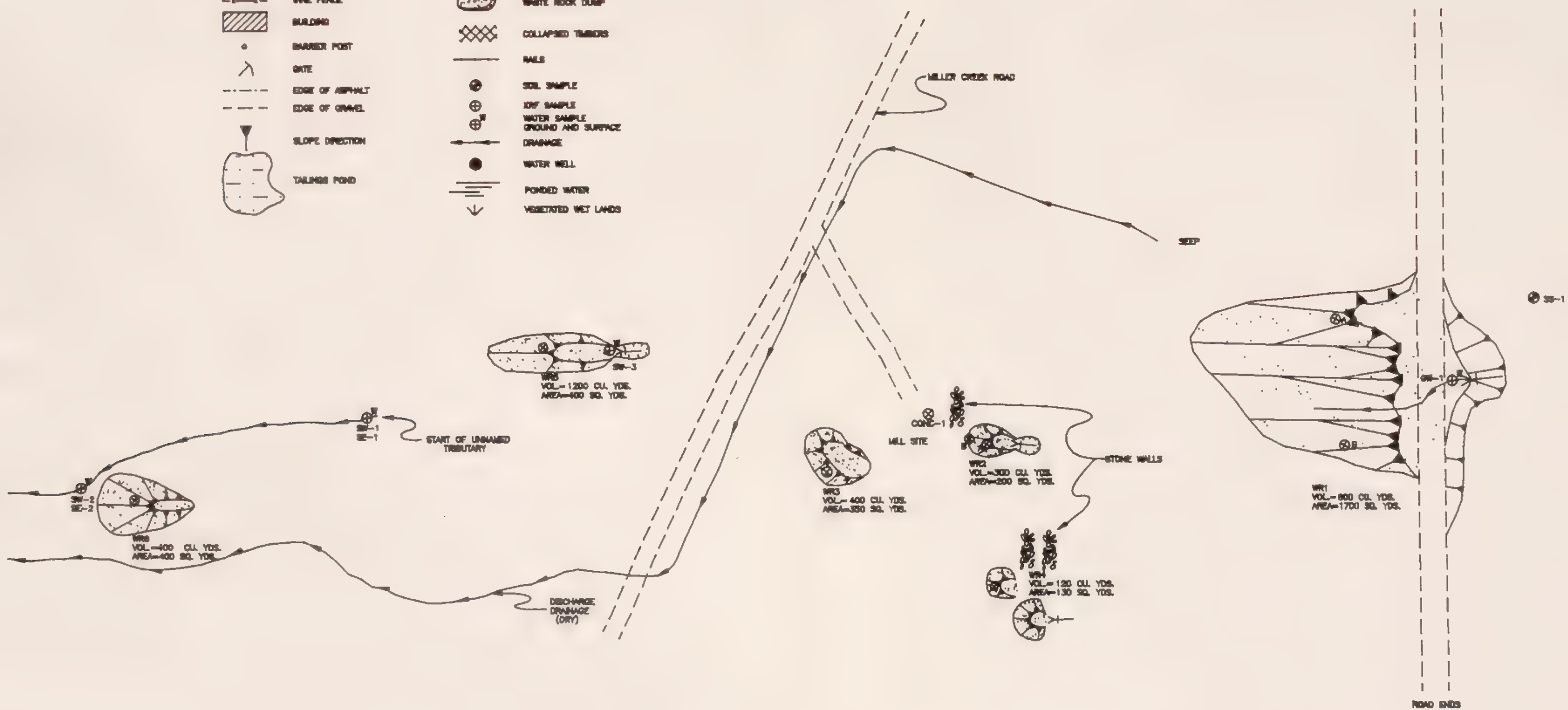
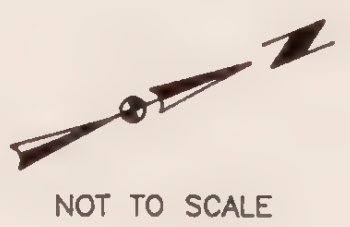
LITTLE DAISY, P.A. NO. 34-009

T09S, R14E, SECTION 14

SCALE: 1" = 1000'



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
○	UTILITY POLE	⊗	OPEN SHAFT
●	DECIDUOUS TREE	⊗	COLLAPSED SHAFT
●	CONIFEROUS TREE	○	EXCAVATION
—	WOOD FENCE	○	WASTE ROCK DUMP
—	WIRE FENCE	⊗	COLLAPSED TIMBERS
▨	BUILDING	—	RAILS
○	BARBER POST	⊕	SOIL SAMPLE
∧	GATE	⊕	XRF SAMPLE
---	EDGE OF ASPHALT	⊕	WATER SAMPLE
---	EDGE OF GRAVEL	⊕	GROUND AND SURFACE
▲	SLOPE DIRECTION	—	DRAINAGE
○	TAILINGS POND	●	WATER WELL
		—	PONDED WATER
		—	VEGETATED WET LANDS



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
LITTLE DAISY PA# 34-009  
NEW WORLD DISTRICT PARK COUNTY

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
SPokane

DRAWN: JTP DATE: 11 NOV 93  
DESIGNED: JTP JOB NO.: 83-17  
APPROVED: MJB F.B. NO.:  
F.B. NO.:





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





# SOURCE INVENTORY FORM

SAMPLERS: Flammang, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	800	Western lobe, 7 feet below top of knob	None	6.3 (D)	0.05	34-009-WR-1	08/09/93 1730	T-Metals, ABA
WR-1B	WR		Eastern lobe, 1/2 way down knob	None	6.6 (D)	0.04			
WR-2A	WR	300	Above lower rock foundation approx. 35 feet in orange material	None	6.5 (D)	0.05	34-009-WR-2	08/09/93 1735	T-Metals, ABA
WR-2B	WR		Just east of end of lower stone wall	None	6.6 (D)	0.04			
WR-3	WR	400	East of WR-2, on top levels of two levels approx. 5 feet below top	None	6.9 (D)	0.05			
WR-4	WR	120	Southeast of upper stone foundation	None	6.9 (D)	0.05			
WR-5	WR	1,200	Just below Adit #3, down drainage from lower stone foundation	None	5.2 (D)	0.05	34-009-WR-3	08/09/93 1740	T-Metals, ABA
WR-6	WR	400	Approx. 1,500 feet down from WR-2, 5 feet below top of knob	None	6.6 (D)	0.04			
Conc-1	CONC	Approx. 10	Black sands on lower stone foundation	None	N/A	N/A	N/A	N/A	
SS-1	BKGRND	N/A	Background soil 100 feet west and 50 feet north of Adit #1 (WR-1)	None	NM	0.04	34-009-SS-1	08/09/93 0800	T-Metals

\*D-Direct Reading (Kilovolt Meter); S-Saturated Paste (Oxide Meter)

Comments or deviations from SOPs: 34-009-WR-1 is composite of WR-1A and -1B. 34-009-WR-2 is composite of WR-2A and -2B, WR-3, and WR-4. 34-009-WR-3 is composite of WR-5 and WR-6.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 1 Identification: At WR-1

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes    , No X, Number:     Identification:    

Groundwater wells within 4 miles?: Yes X, No    ;

Number of well logs: 113

Distance to nearest well used for drinking? Approx. 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable    , Possible X, Unlikely    .

Uncontained sources only slightly elevated metal values; groundwater-field parameters are good.

Other observations/notes: N/A



## SAMPLERS: Babits

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Unnamed tributary to Miller Creek

Dry streambeds: Yes X, No     , Name(s): Dry drainages throughout site

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-6 is in unnamed tributary.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 15 gpm

High Flow: 18 gpm, Average Flow: 9 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet between WR-6 and unnamed tributary.

Surface water draining onto or through waste sources: Yes X, No     , Describe: Adit discharge flows over WR-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Irrigation, Yellowstone Park, wilderness, wetland, fishery, T&E habitat (Grizzly and possibly wolf)

Observed erosional/sedimentation/stream turbidity problems? Yes     , No X, Distance downstream (ft)?      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):

## SAMPLERS: Babits

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 to 15 acres

Wetlands present: Yes X, No    , Describe: Streamside

Carbonate rocks/soils: Yes X, No    , Describe: Rocks in float

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10    ; 10-30    ; 30-100    ; 100-300 X; 300-1,000    ; 1,000-3,000    ; 3,000-10,000    ; 10,000 or greater    ; Comments    

Nearest residence(ft or miles)? Approx. 2.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Flammang, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3 (small)	Partial	15,300	15,300	Yes	Low
WR-2	SO3	Dry	1,800	1,800	Yes	Low
WR-3	None	Dry	3,150	2,205	No	None
WR-4	SO3 (few)	Dry	1,170	585	No	None
WR-5	SO3	Dry	3,600	3,528	Yes	Low
WR-6	None	Dry	3,600	2,700	Yes	Low
CONC	SO3	Dry	Approx. 50	Approx. 50	Yes	Low
Adit #1	None	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe: WR-2  
and -3 are directly adjacent to good access road (2WD) to popular lake  
and hiking area. \_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? WR-1 has an  
unlocked cable gate; no restrictions to the rest of the site. \_\_\_\_\_

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u>X</u> , No____, Comment <u>Yellowstone</u>
Wilderness Area -	Yes <u>X</u> , No____, Comment <u>Absaroka/Beartooth</u>
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Grizzly</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality -	High <u>X</u> , Medium____, Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>4</u>
Sport Fishery Classification -	<u>5</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 1, types and locations: WR-1 has fairly steep banks and is  
unvegetated. \_\_\_\_\_  
\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## **Bibliography**

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Little Daisy, Prepared by Mark Carlstrom and Ben Mundie, September 18, 1979.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Little Daisy, Prepared by Chen-Northern, August 17, 1989.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1986.





LABORATORY ANALYTICAL DATA

LITTLE DAISY  
PA NO. 34-009





Little Daisy PA# 34-009  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/09/93

### SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-009-SE-1	12.7 U	136	1.4 U	22.4 J	43.9	279	38200	0.097 J	2610 J	42.7	72.9 J	16.5 U	380	NR
34-009-SE-2	11.4 J	46.5	0.6 U	7.9 J	12.4	146	22100	0.105 J	593 J	11.6	92.4 J	6.8 U	106	NR
34-009-WR-1	19.1 J	26.3	1.7	3.94 J	27.7	1520	80500	1.08 J	1510 J	19.3	238 J	4.69 U	201	NR
34-009-WR-2	17.4 J	71.2	2.3	9.91 J	24.8	763	78200	0.175 J	2520 J	19.9	431 J	6.28 U	546	NR
34-009-WR-3	7.22 J	29	0.5 U	12.5 J	17.1	138	29400	0.222 J	618 J	17.1	49.3 J	5.99 U	35.1	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.057 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

### Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	t/1000x	%	t/1000x	%	t/1000x	%	t/1000x	%	t/1000x	%	t/1000x	%	t/1000x
34-009-WR-1	3.59	112	48.6	-63.6	<0.01	2.00	1.87	62.5	1.87	62.5	2.00	1.87	-13.9	
34-009-WR-2	0.35	10.9	15.8	4.90	0.01	0.06	0.28	1.87	0.28	1.87	0.06	0.28	14.0	
34-009-WR-3	0.51	15.9	74.7	58.7	0.13	0.07	0.31	2.19	0.31	2.19	0.07	0.31	72.5	

### WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-009-GW-1	3.17	9.03	2.57 U	9.7 U	6.83 U	96.1 JX	4150 JX	0.07 J	1460	37.2 J	526	30.7 U	167	551
34-009-SW-1	2.08	19.6	2.57 U	9.7 U	6.83 U	4.97 JX	11.8 UJX	0.12 J	10.4	12.7 U	1.79	30.7 U	7.57 U	161
34-009-SW-2	1.5	19.5	2.57 U	9.7 U	6.83 U	5.27 JX	24 JX	0.09 J	5.97	12.7 U	2.96	30.7 U	7.57 U	155

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-009-GW-1	730	6	341	0.31	NR
34-009-SW-1	234	< 5.0	76	0.57	NR
34-009-SW-2	235	< 5.0	75	0.57	NR

### LEGEND

SE1 - Headwaters of unnamed tributary of Miller Creek.  
SE2 - In unnamed tributary at PIPE of waste rock dump 6.  
WR1 - Composite of subsamples WR1A and 1B.  
WR2 - Composite of subsamples WR2A, 2B, 3, and 4.  
WR3 - Composite of subsamples WR5 and 6.  
BACKGROUND - 100' West, 50' to North of adit #1 (WR-1).  
From Little Daisy Mine (34-009-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**XRF ANALYSIS RESULTS**

**LITTLE DAISY  
PA NO. 34-009**





XRF Field Analyses

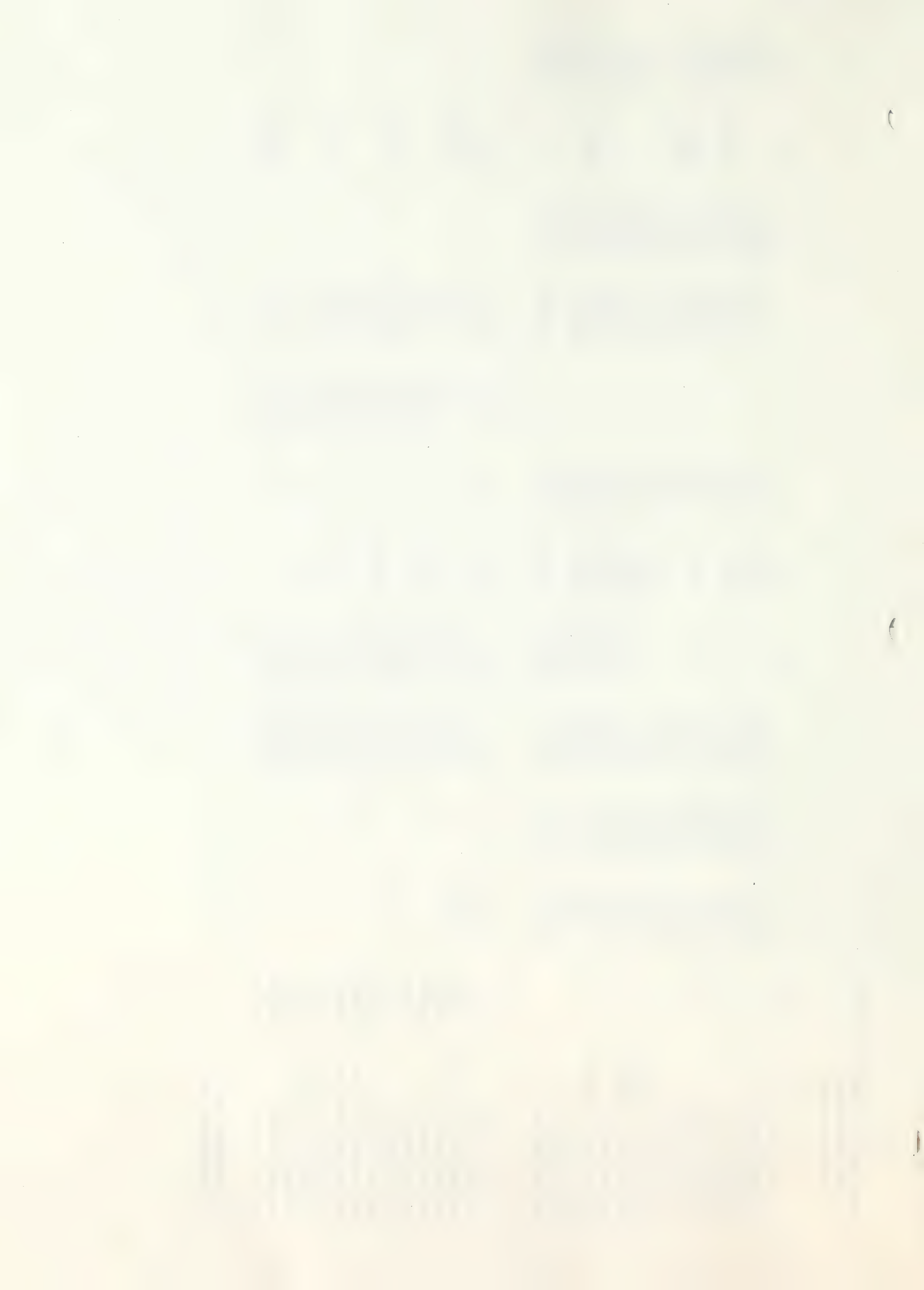
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-009-CONC-1		662.429 *	6746.73	284.737 *		2405.2 *	590449		12611.8	3134.76		29.913 *
34-009-CONC-1-DUP		820.416 *	6789.15	271.656 *		2028.6 *	589362		12142.4	3098.01		33.0252 *
34-009-SS-1		19834.7	9536.47	2129.91		2403.01	46595.4		109.016 *	313.02	45.023 *	355.229
34-009-WR1-A		28704.7	23454	1291.52	178.678 *		105493		108.634 *	148.381 *		326.604
34-009-WR1-B		13780.2	11215.8	981.5		4383.49	105998		1423.57	273.445	46.9142 *	125.949
34-009-WR2-A		28614.5	2664.05	1449.25		11037	75902.9		63.6016 *	62.1616 *	83.1986 *	346.826
34-009-WR2-B		8344.29	8876.54	909.145			250979		2240.05	1698.02		
34-009-WR-1-COMP		18589.8	19829.6	1063.94		2063.21	87309.7		712.182	247.289		184.471
34-009-WR-2-COMP		18808.8	5206.03	969.461	203.812 *	2287.29	76825.8		252.072	268.877		233.971
34-009-WR-3		31794	3638.96	1196.65	264.152 *	1693.08	47209.9		153.068 *	108.277 *		315.471
34-009-WR-3-COMP		15697.3	16102.3	2378.53	176.891 *	891.63 *	49200.6		133.077 *	93.9557 *	37.5251 *	270.998
34-009-WR-4		19929	11347.1	1882.55	160.057 *	2589.96	63414.2		281.546	367.275		359.03
34-009-WR-5		17622.5	4177.12	2776.69	152.02 *		57629.4			69.5252 *		159.865
34-009-WR-6		14131.5	29573.5	2242.57	193.374 *	1227.55 *	49748.5		149.089 *	54.711 *		370.256

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
34-009-CONC-1	188.353	202.923 *		12019.2	118.78 *	783.379 *			575.305 *		20.8632 *
34-009-CONC-1-DUP	179.773	258.464 *		11417.2	118.335 *	1015.78 *			530.028 *		24.2092 *
34-009-SS-1	145.129			188.526	114.487			1417.9			10.6756 *
34-009-WR1-A	140.697			190.753	179.422	193.329 *		3038.65	108.511 *		
34-009-WR1-B	97.5619			82.3354 *	81.7132			1244.2	199.166 *		
34-009-WR2-A	146.771			70.2904 *	123.947			1603.04	100.707 *		7.36548 *
34-009-WR2-B	96.9028			1592.4	97.2845	437.089 *		53.6981 *	220.941 *		
34-009-WR-1-COMP	90.6865			166.117	101.352			1746.41	115.577 *		
34-009-WR-2-COMP	119.523			240.106	98.6357			1063.9	81.2644 *		12.0503 *
34-009-WR-3	130.156			65.2893 *	138.046			2090.24	102.126 *		
34-009-WR-3-COMP	138.953			37.8093 *	84.1964			1187.98			
34-009-WR-4	141.496			294.024	112.193			1792.96	85.0637 *		
34-009-WR-5	223.782			44.4155 *	100.592			1073.48	94.4829 *		7.52204 *
34-009-WR-6	100.634			59.0963 *	87.1725			1517.83			10.1239 *

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

LITTLE DAISY  
PA NO. 34-009



# AIMSS SCORESHEET

SITE NAME:

LITTLE DAISY

PA NUMBER:

34-009

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 1.911
6	GW - TARGETS	WELLS - 1 MI. x 2.5	20.0
7		WELLS - 1 TO 4 MI	105
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 125.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 47775
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12		EXCEEDENCES	0
13A	SW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 2.170
16	SW - TARGETS	DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19		FISHERY	1
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 THRU 22 23
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 19964
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	1
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 5
27		LIKELIHOOD SCORE	LINES 25 + 26C 5
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.021
29	AIR - TARGETS	POPULATION - 4 MILES	100
30		NEAREST RESIDENCE	0
31		WETLANDS	10
32		PARKS / WILDERNESS	10
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 THRU 33 125
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 13
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.000
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	1
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 THRU 42 1
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		(LINES 10 + 24 + 35 + 44) / 100,000 0.68



SITE NAME:  
PA NUMBER:

LITTLE DAISY  
34-009

LINE  
NO.

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	0
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00



34-009, #15: WR-2 (lower) and WR-1 (upper)





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MCLAREN MINE PA#: 34-010

Date: August 9, 1993 Time: 1200

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer

Visitors: Earl McCurley, MDSL/AMRB

Weather/Seasonality Observations: Warm (65°F); sunny to thunder-  
storms late in the afternoon; calm to windy (15 mph); cool, wet  
spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #16: Looking at  
ridge (talus or overburden); #17: Looking down on waste rock.  
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Upper part of WR-2 below highwall has been recontoured to a more  
gentle grade; four vegetation test plots have been put in with no  
growth at time of this investigation. Some of the west side lower  
WR-2 has old test vegetation plot markings with very little  
vegetation established. The majority of the eastern portion of the  
lower part of WR-2 has not been recontoured; erosion of WR-2 onto  
soil below would be reduced if slopes were recontoured.  
Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Recontour  
lower eastern part of WR-2, lime, fertilize, and revegetate. Need  
to treat acid mine drainage due to low pH with some elevated  
metals.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MCLAREN MINE PA#: 34-010

Legal Description: T 9S ; R 14E ; Sec. 11 , NW1/4 SW1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 03' 35" Longitude: W 109° 57' 30"

Primary Drainage Basin and Code: Stillwater River/10070005

Secondary Drainage Basin: Stillwater River

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active     , Inactive/Exploration X , Abandoned     .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Beverly Harris,  
Jean Sandberg, and Joseph Swindlehurst, 2812 1st Avenue N,  
Billings, MT 59101. (406) 245-3455; Timothy Lenicheck, 25 Kidder  
Avenue, Sommerville, MA 02144. (617) 628-4634; Gallatin National  
Forest.

Relationship to other mines/sites in the area/district: Little  
Daisy and Black Warrior mines are located just over Daisy Pass from  
this site; on the other side from the next pass is Gold Dust.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Approx. 2/3 of waste rock on the site  
has been recontoured.

General site features: Elevation 9600'-9940' , Slope 25° ,  
Aspect Southeast

Land use: Mining X , Recreational X , Residential     , Urban     ,  
Agricultural     , Other (Specify)    

Area of disturbed/unvegetated lands? 7.1 acres.  
Dimensions:    

Predominant vegetation types: Lodgepole pine (many burned in 1988  
fire), grasses, wildflowers

Access: roads - good X , poor     , 4wd     , trail     .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Water from the site flows into the headwaters of the Stillwater River. Water flows west off the site into an unnamed tributary. Limestone, andesite, and quartz monzonite are present in dumps.

Mining/milling history, ore type/tenor, host rock, gangue: Mining began in 1933. Production from 1933 to approx. 1950 was 824 tons Cu and 36,000 oz. Au. Deposit is pyritic gold; copper minerals are disseminated through xenolith of Gros Ventre beds and part of overlying Gallatin Formation. Sedimentary rocks are surrounded by quartz monzonite. Predominant ore minerals are pyrite, chalcopryite, bornite, covellite, and native copper.

Mine Operation?

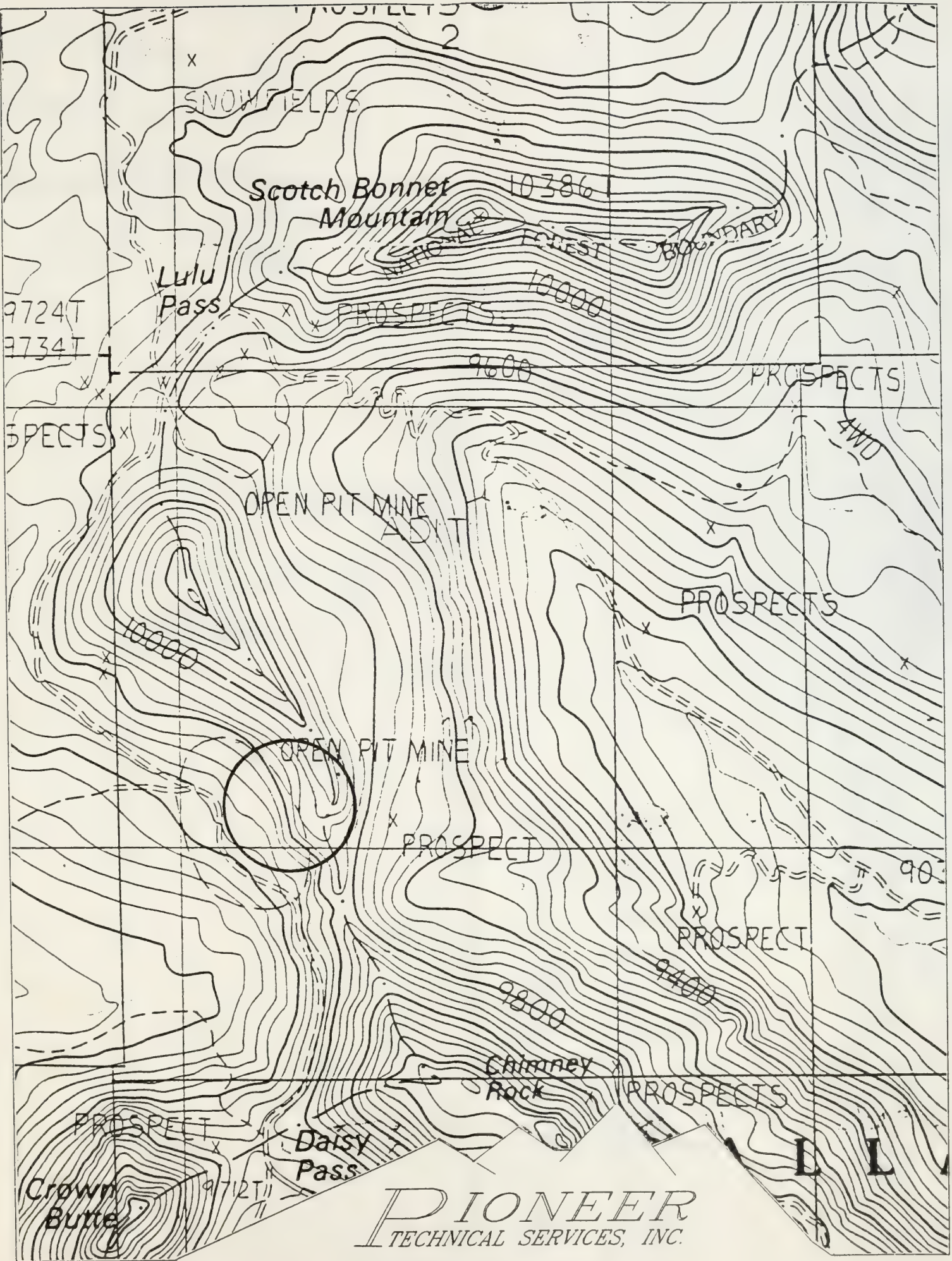
Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 5, Comment At least; collapsed  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes X, No     , # 1, Comment Highwall

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? N/A



*PIONEER*  
TECHNICAL SERVICES, INC.

MCLAREN, P.A. NO. 34-010

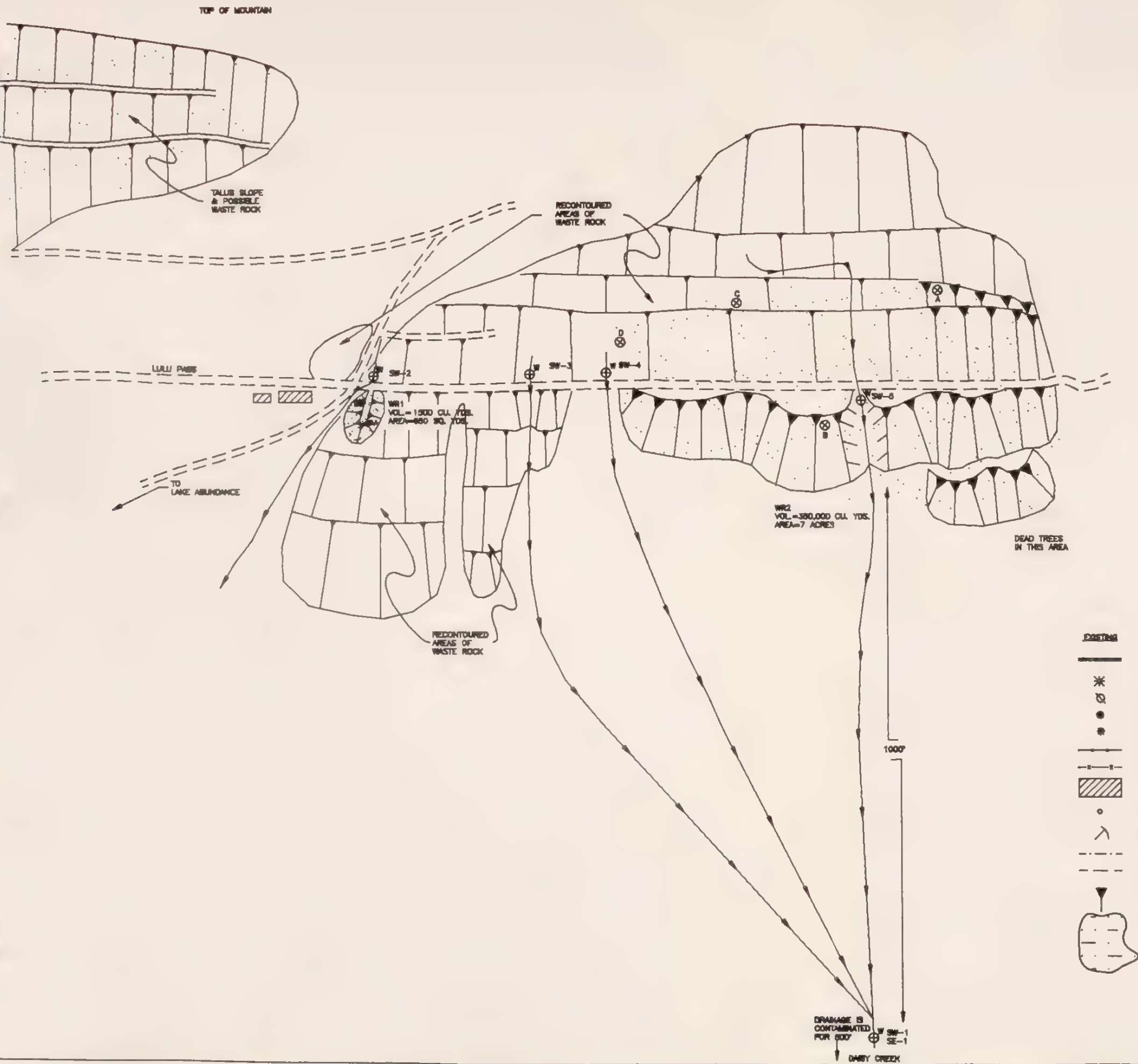
T09S, R14E, SECTION 11

SCALE: 1" = 1000'









NOT TO SCALE

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
○	UTILITY POLE	—	OPEN SHAFT
●	DECIDUOUS TREE	—	COLLAPSED SHAFT
●	CONIFEROUS TREE	—	EXCAVATION
—	WOOD FENCE	—	WASTE ROCK DUMP
—	WIRE FENCE	—	COLLAPSED TIMBERS
▨	BUILDING	—	RAILS
○	BARRIER POST	—	SOIL SAMPLE
>	GATE	—	XRF SAMPLE
---	EDGE OF ASPHALT	—	WATER SAMPLE
---	EDGE OF GRAVEL	—	GROUND AND SURFACE DRAINAGE
▲	SLOPE DIRECTION	—	WATER WELL
—	TAILINGS POND	—	PONDED WATER
		—	VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
MCLAREN PA# 34-010  
NEW WORLD DISTRICT PARK COUNTY

DATE 11 NOV 83  
JOB NO. 83-17  
F.B. NO.

DRAWN JTP  
DESIGNED JPR  
APPROVED WJB

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOTZEMAN-KALISPELL  
MONTANA WASHINGTON



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A





**SAMPLERS:** Flammanq, Lasher

[illegible]

D. Direct Feeding (Kelvyn Meter); 8-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 34-010-WR-1 is composite of WR-1A and -1B. 34-010-WR-2 is composite of WR-2A, -2B, and -2D. 34-010-WR-3 is grab of WR-2C.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Adit #1

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes X, No     , Number: 5 Identification: At least five location all over the site.

Groundwater wells within 4 miles?: Yes X, No     ;  
Number of well logs: 113

Distance to nearest well used for drinking? 3/4 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable     , Possible X, Unlikely     .

Many seeps present throughout the site. Water flows across waste rock surface, disappears, and then reappears; however, metal values in waste rock are only slightly elevated.

Other observations/notes: N/A



**SAMPLERS: Babits**

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

**Comments or Deviations from the SOPs (Pioneer SAP, 1993):**

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No       , Name(s): Headwaters (unnamed tributary) to Stillwater River

Dry streambeds: Yes       , No X, Name(s):       

Other surface water: Yes       , No X, Name(s)/Description:       

Waste materials within any floodplain: Yes X, No        Source ID(s): Material from WR-1 and -2 has washed down into creeks and lines the banks and creek bottoms.

Approximate Flood frequency? X 1 yr,        10 yr,        100 yr

Estimated seasonal flow of stream(s) (cfs)? 20 gpm during sampling  
High Flow: 24 gpm, Average Flow: 15 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; water flows over waste rock in many places.

Surface water draining onto or through waste sources: Yes X, No       ,  
Describe: Seeps are present throughout the site. Water flows into three tributaries across the site, which then continues across waste rock and into Stillwater River.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Wilderness area, wetland, T&E - Grizzly

Observed erosional/sedimentation/stream turbidity problems? Yes X, No       , Distance downstream (ft)? 1000+ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Fines from waste rock have been eroded downstream and line streambanks, floodplains, and creek bottom.



## SAMPLERS: Babits

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 50 acres

Wetlands present: Yes X, No     , Describe: Hydric soils and wetland vegetated with mosses

Carbonate rocks/soils: Yes X, No     , Describe: Limestone rock is present throughout the site.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100 X; 100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ; Comments     

Nearest residence(ft or miles)? 3/4 mile

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none

# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Babits, Flammang, Lasher

[illegible]

### Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Site  
lies on both sides of road for a quarter mile on route to a popular lake  
and snowmobile area; observed motorcyclists on mine roads above main  
road; campfire rings were present.

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u>X</u> , No____, Comment <u>Yellowstone</u>
Wilderness Area -	Yes <u>X</u> , No____, Comment <u>Absaroka/Beartooth</u>
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Grizzly, Peregrine</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>4</u>
Sport Fishery Classification -	<u>4</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 2,  
types and locations: Highwall approx. 600 feet long x 100 feet high;  
talus slopes on upper portion of site are unstable.

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 2, types and locations: Lower portion of WR-2 and WR-1 are  
steep and unvegetated.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Park County, Montana, Information Circular 7546, Written by Glenn C. Reed, February 1950.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for McLaren Mine, Prepared by Chen-Northern, September 13, 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation National Inventory, Phase II Problem Area Data Sheet for McLaren Mine, Prepared by Mark Carlstrom and Ben Mundie, September 19, 1979.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1986.



LABORATORY ANALYTICAL DATA

MCLAREN MINE  
PA NO. 34-010





McLaren PA# 34-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-010-SE-1	33.5 J	41.1	2.0	3.14 J	14.7	1110	131000	0.257 J	195 J	4.7	107 J	6.79 U	123	NR
34-010-WR-1	36.3 J	45.6	1.9	47 J	1.51	1030	152000	0.076 J	27.6 J	21.7	35.4 J	5.92 U	7.71	NR
34-010-WR-2	32.9 J	143	2.81	3.51	11.1 J	887	120000	0.091	117	7.57	112	7.43 UJ	50.2	NR
34-010-WR-3	27.4 J	71.5	2.68	5.37	23.4 J	885	92000	0.049	242	9.9	222	6.76 UJ	192	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.057 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		ACID BASE		SULFUR		NEUTRAL.		SULFUR		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	%	1/1000x	ACID BASE	1/1000x	POTENT.	1/1000x	POTENT.	1/1000x	%	%	PYRITIC	1/1000x	SULFUR	%	ACID BASE	1/1000x	ACID BASE	POTENT.
39-010-WR-1	18.2	567			-14.5	-582	8.18	1.23	8.75	38.4		-53.0						
39-010-WR-2	1.33	41.5			-3.30	-44.8	0.59	<0.01	0.80	0.00		-3.30						
39-010-WR-3	0.55	17.2			5.47	-11.7	0.19	<0.01	0.36	0.00		5.47						

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC.
34-010-SW-1	1.34 JX	27.4	6.3 J	35.8	14.2	6520 JX	24300	1.93	2240	63.8 J	5.08 J	30.7 U	817	203
34-010-SW-5	1.12 UJX	2.01 U	20.3 J	133	41.7	26700 JX	192000	0.48	7150	141 J	6.47 J	30.7 U	3000	344

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
34-010-SW-1	583 <	5.0	356 <	0.05	NR
34-010-SW-5	1870	55	1210 <	0.05	NR

LEGEND

SE1 - At confluence of three mine drainages, approx. 1000' from pit at Daisy Pass Road.  
SW1 - Same as sample SE1.  
SW5 - Discharge emanating from dump.  
WR1 - Composite of subsamples WR1A and 1B.  
WR2 - Composite of subsamples WR2A, 2B, and 2D.  
WR3 - Sample of the WR2C subsample.  
BACKGROUND - From the Little Daisy Mine (34-009-SS-1).





**XRF ANALYSIS RESULTS**

**MCLAREN MINE  
PA NO. 34-010**



## XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-010-SS-1		19834.7	9536.47	2129.91		2403.01	46595.4		109.016 *	313.02	45.023 *	355.229
34-010-WR1-A		1626.84	18381.6	1701.03			62900	486.115 *	501.949	63.5494 *	53.6516 *	77.7651
34-010-WR1-B		3294.47	12446.5	2809.82			77636		771.534	53.323 *	52.3834 *	20.6057 *
34-010-WR2-A		30504.2	6773.29	2771.77			67018.7		236.959	144.11 *		142.782
34-010-WR2-B		28393.5	9829.07	2669.57			165353		1145.42	156.848 *	65.0709 *	123.016
34-010-WR2-C		17858.2	13095.7	2053.42			132694		800.334	225.624	66.241 *	117.504
34-010-WR2-D		12319.7	5473.11	2167.86			199772		450.036		139.289 *	61.463
34-010-WR-1-COMP		2173.58	11353.6	2002.87			65082.9		855.604	67.1854 *	41.5557 *	40.5781
34-010-WR-2-COMP		15963.3	8363.12	2242.44			154276	947.483 *	638.702	74.0113 *	75.5297 *	75.1957
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
34-010-SS-1	145.129			188.526	114.487			1417.9			10.6756 *	
34-010-WR1-A	136.815				23.5037 *			559.903	101.554 *		7.64728 *	
34-010-WR1-B	158.908		4.8731 *		37.7408 *	175.872 *		176.962	84.7394 *			
34-010-WR2-A	234.569		16.296 *	180.455	177.417			915.813	143.486 *		10.4259 *	
34-010-WR2-B	149.924			247.052	173.437	241.24 *		1002.84	162.999 *		10.8573 *	
34-010-WR2-C	151.196		15.2817 *	180.119	94.5206			750.22	162.012 *		6.32787 *	
34-010-WR2-D	91.395			56.5751 *	73.0912	303.924 *		725.048	187.849 *		5.4724 *	
34-010-WR-1-COMP	129.089	40.378 *		23.8993 *	29.5624 *			625.208	114.044 *			
34-010-WR-2-COMP	136.806	56.9453 *	6.74215 *	114.479 *	110.895			859.01	179.45 *		5.87631 *	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

MCLAREN MINE  
PA NO. 34-010





# AIMSS SCORESHEET

SITE NAME:  
PA NUMBER:

MCLAREN MINE  
34-010

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	40.0
7	GW - TARGETS	WELLS - 1 TO 4 MI	97
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
			130972
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD	EXCEEDENCES	100
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	1
18		WETLANDS	10
19	SW - TARGETS	FISHERY	1
20		RECREATION	0
21		IRRIGATION/STOCK	0
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 THRU 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
			152847
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	1
26B	OF RELEASE	DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	30
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	10
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 THRU 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			40
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF	ACCESSIBILITY	20
37B	EXPOSURE	DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT	POPULATION - 1 MILE	1
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	10
43		TARGETS SCORE	SUM LINES 40 THRU 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			53
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		
	(LINES 10 + 24 + 35 + 44) / 100,000		2.84

SITE NAME:

MCLAREN MINE

PA NUMBER:

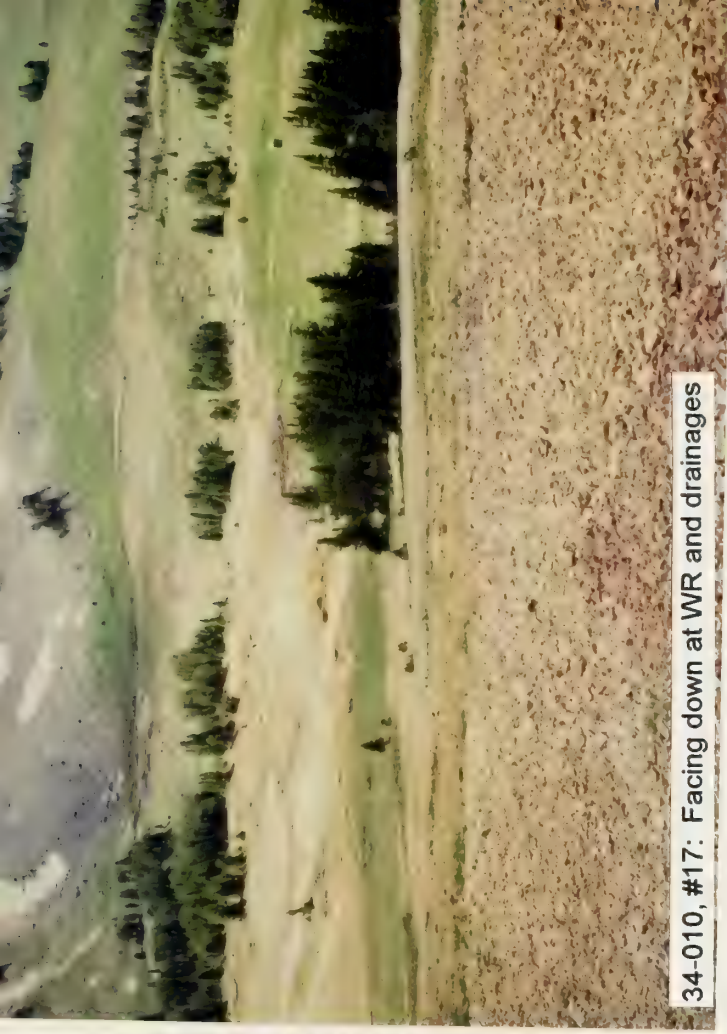
34-010

LINE  
NO.**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	75
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	11
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>16.50</b>



34-010, #16: Facing up at Talus slope



34-010, #17: Facing down at WR and drainages





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: BLACK WARRIOR PA#: 34-079

Date: August 9, 1993 Time: 1700

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy (some slight rain); warm (approx. 65°F); breezy (10 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #18: WR-1, adit and loadout; #19: WR-2 and Miller Creek. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Possible to put some dump material in upper subsidence. Wetland to treat adit discharge although not too acidic.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BLACK WARRIOR PA#: 34-079

Legal Description: T 9S ; R 14E ; Sec. 15 , NE1/4 SE1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 02' 05" Longitude: W 109° 57' 55"

Primary Drainage Basin and Code: Soda Butte/10070001

Secondary Drainage Basin: Miller Creek

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Hardrock/Silver, Gold, Zinc, Lead

Activity Status: Active     , Inactive/Exploration     , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Crown Butte  
Mines, Inc., Petroleum Building, Suite 510, 2812 1st Avenue N,  
Billings, MT 59101. (406) 245-3455; Gallatin National Forest.

Relationship to other mines/sites in the area/district: There is  
a mine further south on Miller Creek and another on the saddle  
above the Black Warrior.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 9700' , Slope 20° ,  
Aspect East

Land use: Mining X , Recreational X , Residential     , Urban     ,  
Agricultural X , Other (Specify)    

Area of disturbed/unvegetated lands? 0.06 acres.  
Dimensions:    

Predominant vegetation types: Grasses

Access: roads - good     , poor     , 4wd X , trail     .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 7 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). The site lies at the headwaters of Miller  
Creek. Water flows off of the site in southeast direction to  
perennial Miller Creek. Seeps are present all over the area. Site  
lies in Gallatin Limestone near a small quartz porphyry.

Mining/milling history, ore type/tenor, host rock, gangue: Mine  
began operating in 1945 and ceased in the same year. Approx. 41  
tons of ore was shipped with average metal content of 0.64 oz. Au,  
14.8 oz. Ag, 17.1% Pb, 3.6% Zn, and 0.11% Cu. Subordinate pyrite,  
chalcopyrite, and sphalerite are contained in a gangue of quartz,  
calcite, and altered limestone. No oxidation products other than  
limonite were observed.

Mine Operation?

Shafts - Yes X, No     , # 1, Comment Open (HMO)  
Adits - Yes X, No     , # 3, Comment 1 open; 2 collapsed  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes X, No     , # 2, Comment Stope; subsidence

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

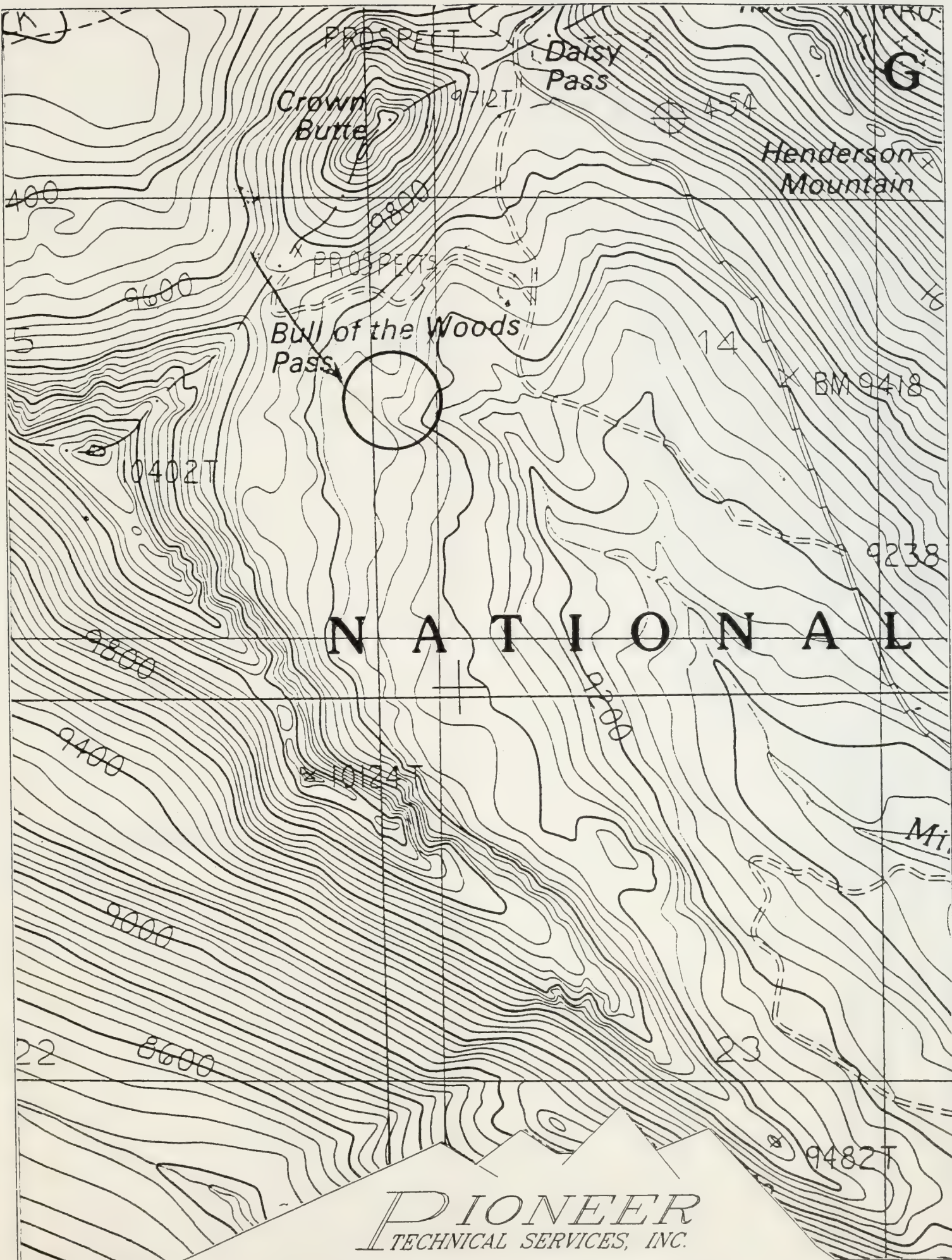
Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:130282	09S 14E 11 A	37.0	0.0	0.00
M:130283	09S 14E 11 A	60.0	0.0	0.00
M:8279	09S 14E 11 CB	0.0	0.0	11.60
M:130288	09S 14E 11 D	71.5	0.0	0.00
M:130284	09S 14E 11 D	45.5	0.0	0.00
M:130287	09S 14E 11 D	30.0	0.0	0.00
M:130290	09S 14E 11 D	12.5	0.0	0.00







BLACK WARRIOR, P.A. NO. 34-079

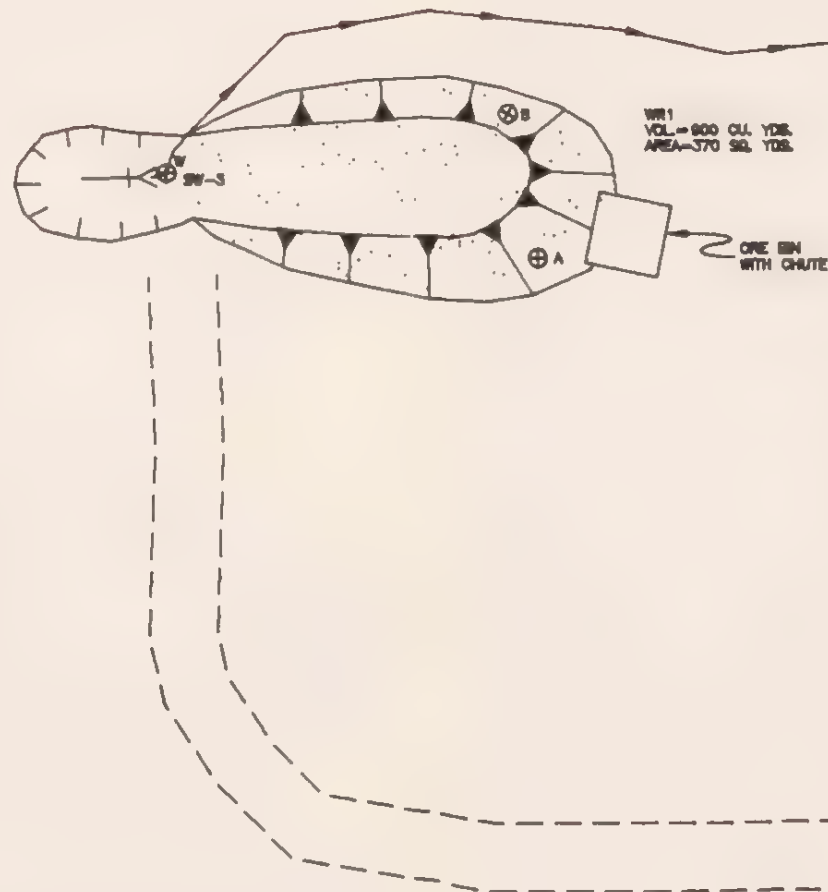
T09S, R14E, SECTION 15

SCALE: 1" = 1000'

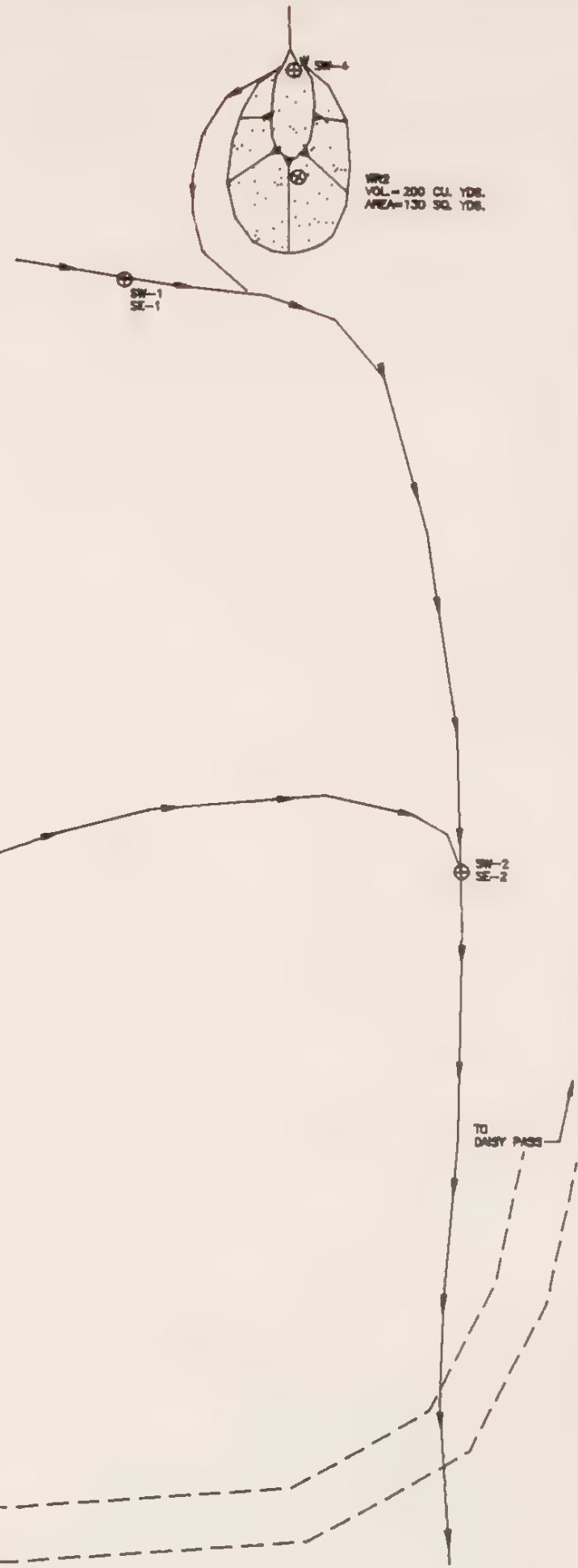




NOT TO SCALE



LEGEND	
	CULVERT
	LIGHT (LIGHT POLE)
	UTILITY POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	WOOD FENCE
	WIRE FENCE
	BUILDING
	BARRIER POST
	GATE
	EDGE OF ASPHALT
	EDGE OF GRAVEL
	SLOPE DIRECTION
	TAILINGS POND
	OPEN ADIT
	COLLAPSED ADIT
	OPEN SHAFT
	COLLAPSED SHAFT
	EXCAVATION
	WASTE ROCK DUMP
	COLLAPSED TIMBERS
	RAILS
	XRF SAMPLE
	WATER SAMPLE GROUND AND SURFACE
	DRAINAGE
	WATER WELL
	PONDED WATER
	VEGETATED WET LANDS



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

BLACK WARRIOR PA# 34-079  
NEW WORLD DISTRICT PARK COUNTY

PIONEER  
ENGINEERING CONSULTANTS

TDSH

DRAWN: JTP DATE: 11 NOV 93  
DESIGNED: JTP JOB NO.: 93-17  
APPROVED: MJB F.B. NO.:

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
SPOKANE MONTANA WASHINGTON

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A





**SAMPLERS:** Flammanq

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs:** 34-079-WR-1 is composite of WR-1A and -1B, and WR-2.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 2 Identification: At WR-1 and WR-2

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes X, No    , Number: 3 Identification: Adjacent to WR-2

Groundwater wells within 4 miles?: Yes X, No    ;

Number of well logs: 107

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable    , Possible X, Unlikely    .

Uncontained sources; discharge from Adit #1 flows slightly across WR-1 and then down side. Metal values in WR-1 are elevated; however, field parameters from both adits discharges are good.

Other observations/notes: N/A



## SAMPLERS: Babits

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Miller Creek

Dry streambeds: Yes X, No     , Name(s): Several dry drainages are in the watershed.

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): Waste rock

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 21 gpm during sampling  
High Flow: 25 gpm, Average Flow: 12 gpm

Distance between waste source(s) and nearest surface water body (ft)? Approx. 5 to 10 feet between WR-2 and Miller Creek.

Surface water draining onto or through waste sources: Yes     , No X, Describe:     

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, national park, wilderness, fishery, stock watering, wetland, T&E - Grizzly

Observed erosional/sedimentation/stream turbidity problems? Yes     , No X, Distance downstream (ft)?      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):



## SAMPLERS: Babits

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 to 10 acres

Wetlands present: Yes X, No     , Describe: Present in valley between WR-1 and WR-2; many seeps and wetland vegetation

Carbonate rocks/soils: Yes X, No     , Describe: Limestone is host rock.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100     ; 100-300 X; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ; Comments     

Nearest residence(ft or miles)? Approx. 2.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none

# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Babits, Flammanq

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments None

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes X, No\_\_\_\_, Comment Yellowstone  
Wilderness Area - Yes X, No\_\_\_\_, Comment Absaroka/Beartooth  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Grizzly  
Bat Habitat - Yes X, No\_\_\_\_, Comment Open adit

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality - High X, Medium\_\_\_\_, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 4  
Sport Fishery Classification - 5

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
One shaft with associated subsidence and one adit

Hazardous structures: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Loadout (very hazardous), one collapsing cabin south of WR-1 with an additional very small wood structure

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes X, No\_\_\_\_, Explain: Wood loadout



## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Park County, Montana, Information Circular 7546, Written by Glenn C. Reed, February 1950.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Black Warrior, Prepared by Chen-Northern, August 14, 1989.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1989.



LABORATORY ANALYTICAL DATA

BLACK WARRIOR  
PA NO. 34-079





Black Warrior PA# 34-079  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-079-SE-1	10.9 J	62	0.92	9.67	17.8 J	35.5	17600	0.040	494	23	168	8.14 UJ	131	NR
34-079-SE-2	7.82 U	67.1	5.55	8.14	20.2 J	37.8	10000	0.054 U	61.8	20.8	78.5	10.2 UJ	743	NR
34-079-WR-1	54 J	52.3	7.76	6.34	11.2 J	981	65000	0.93	736	13.2	14600	25.2 J	2490	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.057 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	NEUTRAL. ACID BASE POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENT. 1/1000	64.9
34-079-WR-1	5.56	174	166	-8.17	<0.01	3.22	4.36

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
34-079-SW-1	1.12 UJX	18.2	2.57 U	9.7 U	6.83 U	5.53 JX	308	0.38	26.1	12.7 U	6.24 J	30.7 U	11.7	82.8
34-079-SW-2	1.12 UJX	20.7	2.57 U	9.7 U	6.83 U	9.33 JX	297	0.29	15.1	12.7 U	5.48 J	30.7 U	49.2	102
34-079-SW-3	1.12 UJX	22.2	2.57 U	9.7 U	7.73	23.4 JX	1320	0.27	65.8	12.7 U	89.8 J	30.7 U	430	127

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N CYANIDE
34-079-SW-1	115	7	49	< 0.05
34-079-SW-2	135	< 5.0	15	< 0.05
34-079-SW-3	168	7	25	< 0.05

LEGEND

SE1 - Upgradient on Miller Creek. Approx. 75' upgradient from waste rock dump 2.  
SE2 - Downgradient of waste rock dump 2 on Miller Creek. Approx. 3' from confluence of adit discharge in creek.  
WR1 - Composite of subsamples WR1A, 1B, and 2.  
BACKGROUND - From the Little Daisy Mine (34-009-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Adit discharge at waste rock dump 1.





**XRF ANALYSIS RESULTS**

**BLACK WARRIOR  
PA NO. 34-079**



XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-079-SS-1		19834.7	9536.47	2129.91		2403.01	46595.4		109.016 *	313.02	45.023 *	355.229
34-079-SS-1		19834.7	9536.47	2129.91		2403.01	46595.4		109.016 *	313.02	45.023 *	355.229
34-079-WR1-A		9674.94	93538.5	2876.21		429.457 *	50561.9		2589.55	128.299 *	41.0899 *	87.7086
34-079-WR1-B	542.958 *	27823.3	4428.96	1521.72	191.02 *	1110.19 *	56095.2		603.759	5822.86		166.965
34-079-WR-1-COMP		48053.1	8930.84	3083.02		846.316 *	68548.9		661.366	2903.21		110.469
34-079-WR-2		46412.6	1554.64	2637.48			56799.2		339.085	618.625		40.4943
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
34-079-SS-1	145.129			188.526	114.487			1417.9			10.6756 *	
34-079-SS-1	145.129			188.526	114.487			1417.9			10.6756 *	
34-079-WR1-A	109.298	37.3341 *		26.5634 *	30.9539 *	179.098 *		425.668	120.751 *		7.93211 *	
34-079-WR1-B	99.2006			10531.5	107.746		78.5879 *	486.06	202.966 *		36.2062 *	
34-079-WR-1-COMP	181.289			7805.47	162.79	229.61 *		586.909	163.999 *		24.8888 *	
34-079-WR-2	216.825			3135.79	228.505			698.753	146.805 *		15.73 *	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

BLACK WARRIOR  
PA NO. 34-079





# AIMSS SCORESHEET

SITE NAME:

BLACK WARRIOR

PA NUMBER:

34-079

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 14.612
6	GW - TARGETS	WELLS - 1 MI. x 2.5	17.5
7		WELLS - 1 TO 4 MI	100
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 117.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 343382
<b>SURFACE WATER PATHWAY</b>			
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE	300
12		EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 16.211
16	SW - TARGETS	DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19		FISHERY	1
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 THRU 22 23
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 260997
<b>AIR PATHWAY</b>			
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE	0
26A		CONTAINMENT	1
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 5
27		LIKELIHOOD SCORE	LINES 25 + 26C 5
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.160
29	AIR - TARGETS	POPULATION - 4 MILES	100
30		NEAREST RESIDENCE	0
31		WETLANDS	10
32		PARKS / WILDERNESS	10
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 THRU 33 125
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 100
<b>DIRECT CONTACT PATHWAY</b>			
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE	0
37A		ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.145
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	0
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 THRU 42 0
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000		6.04

SITE NAME:

BLACK WARRIOR

PA NUMBER:

34-079

LINE  
NO.**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	230
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	0
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>0.00</b>





34-079, #18: Adit, loadout and WR-1



34-079, #19: WR-2 and Miller Creek





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: UPPER ALICE E. PA#: 34-085

Date: August 10, 1993 Time: 1300

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer  
\_\_\_\_\_

Visitors: None  
\_\_\_\_\_  
\_\_\_\_\_

Weather/Seasonality Observations: Warm (65°F-75°F); partly cloudy;  
slight breeze; cool, wet spring and summer.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #22: WR-1; #23: WR-  
2. Video Tape No. 1  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

General Comments/Observations (not covered specifically in attached Inventory Forms):  
A monitoring well exists at the base of WR-2 by the access road; it  
is steel-cased and locked. Site is also known as "Alice E."  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Other Hazardous Materials/Substances Present: N/A  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

General Comments on Potential Remedial Alternatives: Contour,  
coversoil, and revegetate; possible to reprocess for iron.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): UPPER ALICE E. PA#: 34-085

Legal Description: T 9S ; R 14E ; Sec. 24 , NW1/4 SE1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 01' 58" Longitude: W 109° 55' 38"

Primary Drainage Basin and Code: Soda Butte Creek/10070001

Secondary Drainage Basin: Miller Creek

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active ☐ , Inactive/Exploration ☒ , Abandoned ☐ .

Ownership status: Known YX ☒ N ☐ ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Thomas and Betty Hallin, 501 South Yellowstone, Livingston, MT 59047. (406) 222-1780; Crown Butte Mines, Inc., Petroleum Building, Suite 501, 2812 1st Avenue N, Billings, MT 59101. (406) 245-3455; DePuy - Glen #1, Inc., P.O. Box 487, Livingston, MT 59047; Gallatin National Forest.

Relationship to other mines/sites in the area/district: Off Daisy Pass Road; no other mines in the area.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 8700' , Slope 20° ,  
Aspect South

Land use: Mining ☒ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 1 acres.  
Dimensions:

Predominant vegetation types: Lodgepole pine, grasses

Access: roads - good ☒ , poor ☐ , 4wd ☐ , trail ☐ .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 23 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site is underlain by Flathead quartzite  
adjacent to small gabbro plug. Miller Creek lies approx. 1,000  
feet to the west of the mine and flows from north to south.

Mining/milling history, ore type/tenor, host rock, gangue:  
Reported to have produced 2,500 tons of ore between 1893 and 1895.  
Treated in small cyanide plant on property. Ore is largely massive  
pyrite in a siliceous gangue. Pyrite has been altered to limonite  
near the surface.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment Collapsed  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes X, No     , # 1, Comment Subsidence

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: Mill reported in literature, but no  
evidence of mill or tailings were found.

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:106002	09S 14E 25	180.0	10.0	5.00
M:106003	09S 14E 25	61.0	0.0	0.00
M:8297	09S 14E 25 AC	10.0	0.0	4.40
M:8299	09S 14E 25 AC	18.0	0.0	7.10
M:8300	09S 14E 25 AC	21.0	0.0	5.20
M:8303	09S 14E 25 AC	15.0	0.0	7.10
M:8298	09S 14E 25 AC	12.0	0.0	10.80
M:8308	09S 14E 25 ACDA	21.0	0.0	5.40
M:8309	09S 14E 25 ACDA	0.0	0.0	12.40
M:8307	09S 14E 25 ACDA	0.0	0.0	9.20
M:8326	09S 14E 25 ADBD	10.0	0.0	7.20
M:8327	09S 14E 25 ADCA	0.0	0.0	9.80
M:8329	09S 14E 25 ADCB	0.0	0.0	12.60
M:8331	09S 14E 25 ADCB	0.0	0.0	7.30
M:8332	09S 14E 25 ADCC	0.0	0.0	7.80
M:106004	09S 14E 25 B	49.0	40.0	20.00
M:106005	09S 14E 25 B	49.0	40.0	0.00
M:106006	09S 14E 25 BDD	145.0	0.0	0.00
M:26187	09S 14E 25 CBB	45.0	60.0	24.00
M:121237	09S 14E 25 CBB	71.0	30.0	42.00
M:106007	09S 14E 26	240.0	3.0	0.00
M:125781	09S 14E 26 DAA	80.0	40.0	46.00
M:106075	09S 15E 30 ABBD	45.0	20.0	20.00



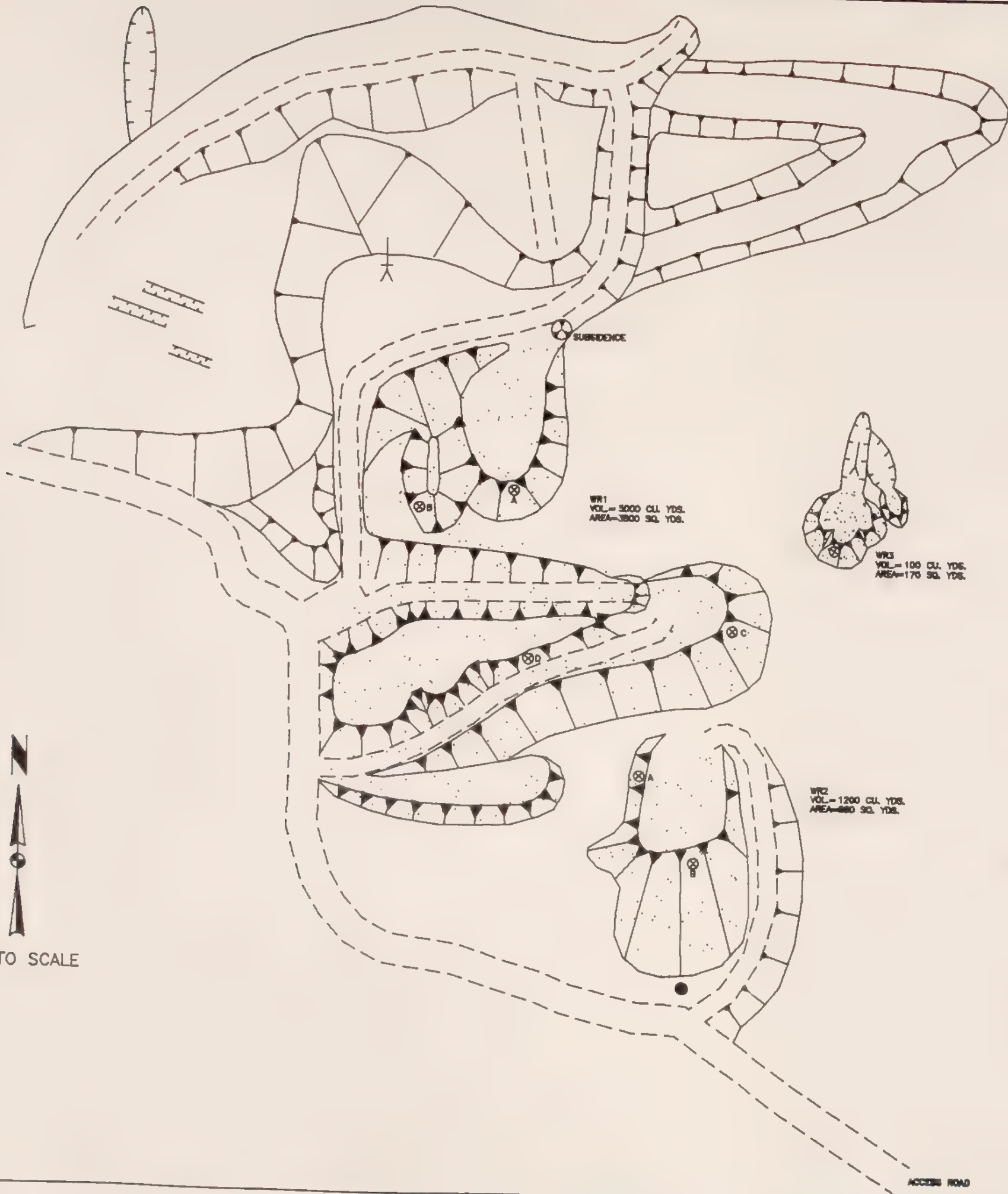








NOT TO SCALE



WR1  
VOL=3000 CU. YDS.  
AREA=3500 SQ. YDS.

WR2  
VOL=1200 CU. YDS.  
AREA=880 SQ. YDS.

WR3  
VOL=100 CU. YDS.  
AREA=170 SQ. YDS.

WR4  
VOL=300 CU. YDS.  
AREA=140 SQ. YDS.

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
⊗	UTILITY POLE	⊗	OPEN SHAFT
●	DECIDUOUS TREE	⊗	COLLAPSED SHAFT
●	CONIFEROUS TREE	⊗	EXCAVATION
—	WOOD FENCE	⊗	WASTE ROCK DUMP
—	WIRE FENCE	⊗	COLLAPSED TIMBERS
▨	BUILDING	—	RAILS
○	BARRIER POST	⊕	SOIL SAMPLE
∧	GATE	⊕	XRF SAMPLE
- - -	EDGE OF ASPHALT	⊕	WATER SAMPLE
- - -	EDGE OF GRAVEL	⊕	GROUND AND SURFACE
▲	SLOPE DIRECTION	—	DRAINAGE
▲	TAILINGS POND	●	WATER WELL
		—	PONDED WATER
		—	VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
UPPER ALICE E. PA# 34-085  
NEW WORLD DISTRICT PARK COUNTY

DATE 11 NOV 83  
JOB NO. 93-17  
F.B. NO.  
DRAWN JTP  
DESIGNED TPR  
APPROVED WJB  
THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON



SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A





# SOURCE INVENTORY FORM

SAMPLERS: Babits

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)*	RADIO-ACTIVITY (MR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	5,000	Upper level; east side of WR-1	None	6.8 (D)	0.04	34-085-WR-1	08/10/93 1630	T-Metals, ABA
WR-1B	WR		Upper level; west side of WR-1	None	6.0 (D)	0.04			
WR-1C	WR		Middle level; east side of WR-1	None	6.2 (D)	0.07			
WR-1D	WR		Lowest level; east side of WR-1	None	6.4 (D)	0.07			
WR-2A	WR	1,200	West side of WR-2	None	< 3.5 (D)	0.03			
WR-2B	WR		South side of WR-2	None	< 3.5 (D)	0.05			
WR-3	WR	100	South side of WR-3	None	4.8 (D)	0.05	34-085-WR-2	08/10/93 1645	T-Metals, ABA
WR-4	WR	300	South side of WR-4	None	4.8 (D)	0.03			

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 34-085-WR-1 is composite of WR-1A through -1D, and WR-2A and -2B. 34-085-WR-2 is composite of WR-3 and WR-4. See Little Daisy (34-009) for background soil sample.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;

Number of well logs: 112

Distance to nearest well used for drinking? Approx. 1.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible\_\_\_, Unlikely X.

Uncontained sources with slightly elevated metal values, but depth to water is probably great.

Other observations/notes: N/A



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

**Comments or Deviations from the SOPs (Pioneer SAP, 1993):**

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Dry streambeds: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Other surface water: Yes\_\_\_\_, No X, Name(s)/Description:\_\_\_\_\_

Waste materials within any floodplain: Yes\_\_\_\_, No X Source ID(s):\_\_\_\_\_

Approximate Flood frequency?\_\_\_\_1 yr,\_\_\_\_10 yr,\_\_\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow:\_\_\_\_\_, Average Flow:\_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)?\_

Approx. 200 feet

Surface water draining onto or through waste sources: Yes\_\_\_\_, No X,

Describe:\_\_\_\_\_

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,

residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)

Fishery, irrigation, wetland, Yellowstone Park, T&E - Grizzly

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_,

No X, Distance downstream (ft)?\_\_\_\_\_ Describe/explain (Note streambank

stability and condition of streambank vegetation and any manmade structures or channel changes present): \_\_\_\_\_



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH  $\leq$  5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes ☐ , No ☒ , Describe:

Carbonate rocks/soils: Yes ☒ , No ☐ , Describe: Limestone on-site

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_;  
100-300 X; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or  
greater\_\_\_\_; Comments\_\_\_\_\_

Nearest residence(ft or miles)? 1.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3	Partial	34,200	34,200	No	Low
WR-2	SO3; pH	Partial	7,920	7,920	No	Low
WR-3	pH	Partial	1,530	1,530	No	Low
WR-4	pH	Partial	1,260	1,260	No	Low

Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30 X; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Fire  
pit on WR-2

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes X, No\_\_\_\_, Comment Yellowstone  
Wilderness Area - Yes X, No\_\_\_\_, Comment Absaroka/Beartooth  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Grizzly  
Bat Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality - High X, Medium\_\_\_\_, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 4  
Sport Fishery Classification - 5

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Subsidence at Adit #1

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations: \_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: \_\_\_\_\_



## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Park County, Montana, Information Circular 7546, Written by Glenn C. Reed, February 1950.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Upper Alice E., Prepared by Chen-Northern, August 25, 1989.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1989.



LABORATORY ANALYTICAL DATA

UPPER ALICE E.  
PA NO. 34-085





Upper Alice East PA# 34-085  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/10/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-085-WR-1	17.4 J	80.4	0.80	4.23	1.4 U	174	81800	0.651	45.2	3.51	252	6.29 UJ	104	NR
34-085-WR-2	41.6 J	80.1	0.59 U	3.07	12.3 J	120	46100	0.215	63.2	6.72	3440	7.04 UJ	68	NR
BACKGROUND	14.6 J	89	0.4 U	10.5 J	30.7	40	23300	0.057 J	1450 J	20.7	158 J	5.17 U	181	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE 1/1000	NEUTRAL, POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE 1/1000	SULFUR ACID BASE POTENT. 1/1000
34-085-WR-1	11.3	354	-3.11	-357	3.11	2.65	5.56	82.8	-85.9
34-085-WR-2	0.77	24.1	-2.68	-26.7	0.53	0.09	0.15	2.81	-5.49

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, 1D, 2A, and 2B.  
WR2 - Composite of subsamples WR3 and 4.  
BACKGROUND - From the Little Daisy Mine (34-009-SS-1).





XRF ANALYSIS RESULTS

UPPER ALICE E.  
PA NO. 34-085



XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-085-WR1-A		22971.7	4039.25	2964.5	148.141 *		48597.4		104.391 *	54.4759 *		96.4873
34-085-WR1-B		12936.6	6259.96	1424.81		564.855 *	203447		828.581	71.8319 *	73.9904 *	191.376
34-085-WR1-C		19078.9	3882.37	3659.16			95919.9		207.225 *		73.646 *	140.283
34-085-WR1-D		41820	1287.88	3188.55			10962.8					15.4666 *
34-085-WR2-A		13626.6	1123.08	1033.57	174.716 *		99451.2		151.365 *	268.506	37.5132 *	
34-085-WR2-B		24658.8	1502.35	1764.51	217.987 *		30052.3		189.996	138.789 *		84.8333
34-085-WR-1-COMP		23592.3	4811.57	2600.48			87146.3		288.07	107.191 *	65.9975 *	86.175
34-085-WR-2-COMP		16529.4	12022.9	2713.65			67403.9		83.9444 *	131.621 *	67.1782 *	606.516
34-085-WR-3		17717.4	2718.46	1793.54			58474.7		81.922 *	48.3337 *	93.8978 *	222.322
34-085-WR-4		16568.9	12930.6	2666.98			60134.6		70.8408 *	59.2227 *		710.997
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
34-085-WR1-A	273.022			253.611								
34-085-WR1-B	124.346				82.3677			1386.76	170.66 *			
34-085-WR1-C	341.824			212.387	112.336			1599.87	109.417 *		34.3656	
34-085-WR1-D	342.411			103.891	144.757			672.107	62.8599 *		20.3584 *	
34-085-WR2-A	74.5512	34.3653 *	3.8477 *	57.2328 *	31.5718 *	160.45 *	46.1468 *	59.3989	105.9 *			
34-085-WR2-B	223.3			966.777	107.59			1457.49	132.77 *		22.4042 *	
34-085-WR-1-COMP	225.727			190.512	94.6539			1083.61	131.94 *		13.1743 *	
34-085-WR-2-COMP	146.101			203.577	71.5783			903.406	95.5112 *		9.0155 *	
34-085-WR-3	141.042			364.198	101.301			802.773				
34-085-WR-4	143.57			73.8928 *	62.8833			690.531	101.973 *		6.6637 *	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

UPPER ALICE E.  
PA NO. 34-085



# AIMSS SCORESHEET

SITE NAME:

UPPER ALICE E.

PA NUMBER:

34-085

LINE NO.		GROUNDWATER PATHWAY	PA NUMBER:	34-085
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	40
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	40
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.290
6	GW - TARGETS	WELLS - 1 MI. x 2.5		57.5
7		WELLS - 1 TO 4 MI		89
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	146.5
10		GROUNDWATER SCORE		LINES 4 x 5 x 9
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A	SW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.605
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	23
24		SURFACE WATER SCORE		LINES 14 x 15 x 23
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		1
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	5
27		LIKELIHOOD SCORE	LINES 25 + 26C	5
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.054
29	AIR - TARGETS	POPULATION - 4 MILES		100
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		10
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	125
35		AIR PATHWAY SCORE		LINES 27 x 28 x 34
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.043
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	15
44	DIRECT CONTACT SCORE		LINES 38 x 39 x 43	97
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			0.09

SITE NAME:  
PA NUMBER:

UPPER ALICE E.  
34-085

LINE  
NO.

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	50
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	15
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	15.00





34-085, #23: WR-2



34-085, #22: WR-1



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: FISHER CREEK NO.1 PA#: 34-090

Date: August 10, 1993 Time: 0745

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Warm (75°F); sunny; calm; cool,  
wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #20: WR-4; #21: WR-1  
and WR-2. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms):  
Site lies approx. 100 yds. off of road to Fisher Creek, barely  
discernable. A track goes into the site below WR-1.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Potential to  
reprocess waste rock. Mine drainage is near neutral pH, with low  
metals loading, and low volume.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): FISHER CREEK NO. 1 PA#: 34-090

Legal Description: T 9S ; R 15E ; Sec. 18 , NW1/4SW 1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 02' 15" Longitude: W 109° 55' 11"

Primary Drainage Basin and Code: Clark Fork Yellowstone/10070006  
Secondary Drainage Basin: Fisher Creek

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX N ; private/public? Public  
Owner, Agent, or Contact (Include address and phone when available): Gallatin  
National Forest, P.O. Box 130, Bozeman, MT 59771.

Relationship to other mines/sites in the area/district: Many mines  
exist further north on Daisy Pass.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 9100' , Slope 5° ,  
Aspect East

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☐ , Other (Specify) Logging

Area of disturbed/unvegetated lands? 0.2 acres.  
Dimensions: \_\_\_\_\_

Predominant vegetation types: Douglas fir, Lodgepole pine

Access: roads - good ☒ , poor ☐ , 4wd ☐ , trail ☐ .  
Other logistical considerations (proximity to other sites). Drive  
to within 100 yds., then 4WD.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on unnamed tributary to  
perennial Fisher Creek. Water from the site flows east away from  
the site. Site is underlain by quartzite, andesite and  
shales/siltstones of Precambrian.

Mining/milling history, ore type/tenor, host rock, gangue: No  
information available.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 5, Comment 3 open; 2 caved  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting?  
N/A

Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

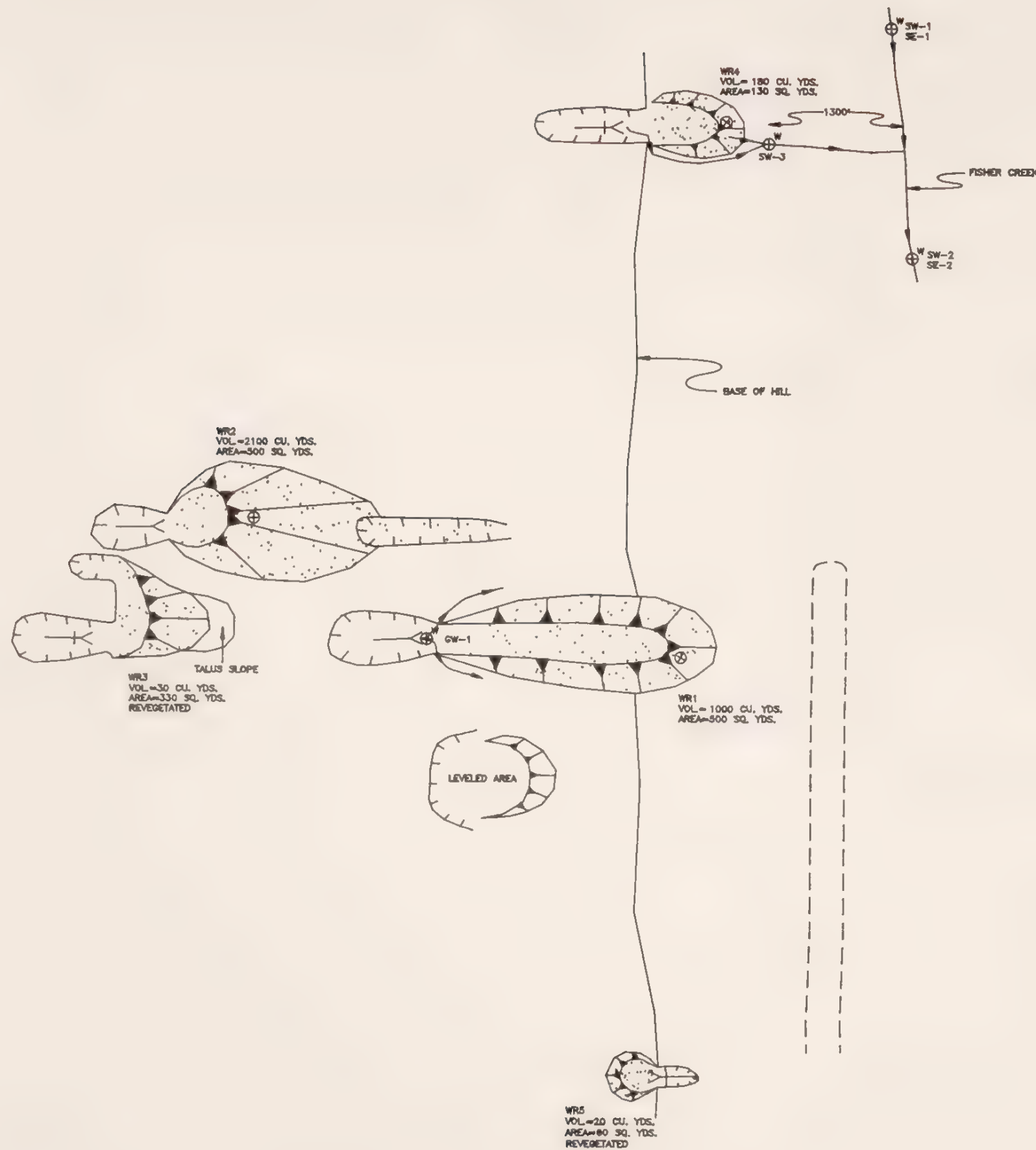
Well No.	Location	Depth	Yield	Static Water Level
M:106065	09S 15E 20 CCCD	41.0	20.0	10.00
M:130292	09S 14E 12 C	28.3	0.0	0.00











EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WASTE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARRIER POST		SOIL SAMPLE
	GATE		XRF SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE GROUND AND SURFACE
	EDGE OF GRAVEL		DRAINAGE
	SLOPE DIRECTION		WATER WELL
	TAILINGS POND		PONDED WATER
			VEGETATED WET LANDS

NOT TO SCALE

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

FISHER CREEK #1 PA# 34-090  
NEW WORLD DISTRICT PARK COUNTY

PIONEER  
TECHNICAL SERVICES, INC. BUTTE, MT.

TPSH

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

DRAWN JTP DATE REV 1/11/85  
DESIGNED TPR JOB NO. 93-17  
APPROVED WJB F.B. NO.

PLOT SCALE: 1" = 60'

PT340701.DWG

1

SHEET NO.

1





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

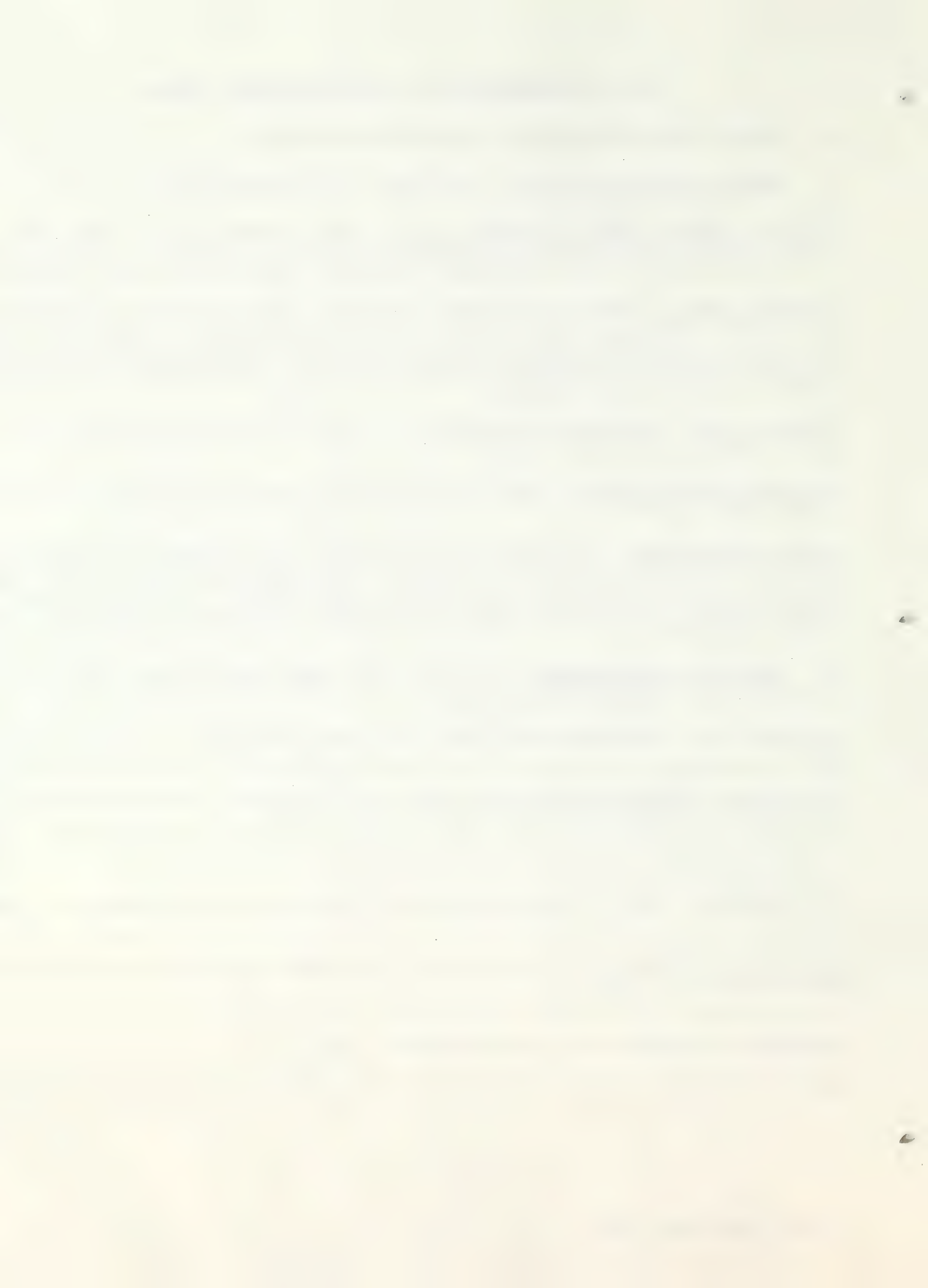
Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



SAMPLERS: Flammanq

[illegible]

D. Direct reading (Relay Meter); S. Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 34-090-WR-1 is composite of WR-1 and WR-2. 34-090-WR-2 is grab of WR-4. See Little Daisy (34-009) for background soil sample.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No      , Number: 2 Identification: Adit #1 and Adit #3

Filled shafts: Yes      , No X , Number:      Identification:     

Seeps/Springs: Yes X , No      , Number: 1 Identification: At base of WR-4, possibly adit discharge

Groundwater wells within 4 miles?: Yes X , No      ;  
Number of well logs: 97

Distance to nearest well used for drinking? 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite      , Probable      , Possible X , Unlikely      .

Some values in dumps were elevated indicating possible metals still available in adits and in contact with groundwater.

Other observations/notes: N/A



**SAMPLERS:** Lasher

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Unnamed tributary to Fisher Creek headwaters

Dry streambeds: Yes X, No     , Name(s): Several dry channels on WR-2

Other surface water: Yes X, No     , Name(s)/Description: Seeps present all over site.

Waste materials within any floodplain: Yes X, No      Source ID(s): Waste rock

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 2 to 3 gpm

High Flow: 4 gpm, Average Flow: 1 gpm

Distance between waste source(s) and nearest surface water body (ft)?       
Water seeps from the toe on both east and west sides of WR-3. Water discharge from Adit #1 flows across WR-1. Fisher Creek is 1,300 feet from the site.

Surface water draining onto or through waste sources: Yes X, No     , Describe: See above

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Fishery, wetland, Yellowstone Park, T&E - Grizzly

Observed erosional/sedimentation/stream turbidity problems? Yes     , No X, Distance downstream (ft)?      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None observed at time of investigation.



**SAMPLERS:** Lasher

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 3 acres of shallow sloping ground in from of waste rock

Wetlands present: Yes X, No     , Describe: Many seeps are present on the site with associated small areas of wetland vegetation; just below the site to the east are larger areas of wetlands.

Carbonate rocks/soils: Yes X, No     , Describe: Few pieces of limestone float

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100 X; 100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ; Comments     

Nearest residence(ft or miles)? 2.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammanq, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	pH; SO3 (lots)	Dry	4,500	3,375	Yes	Low
WR-2	pH; SO3 (lots)	Dry	4,500	4,455	Yes	None
WR-3	None	Dry	2,970	594	No	None
WR-4	SO3 (some)	Partial	1,170	877	Yes	Low
WR-5	None	Dry	540	0	No	None
SW-3	None	N/A	N/A	N/A	N/A	N/A
GW-1	None	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Pop cans, campfire ring

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes X, No\_\_\_\_, Comment Yellowstone  
Wilderness Area - Yes X, No\_\_\_\_, Comment Absaroka/Beartooth  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Bald Eagle  
Bat Habitat - Yes X, No\_\_\_\_, Comment 3 open adits

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low X  
Fisheries Habitat and Species Classification - 6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 3, types and locations: Inclined shaft at Adit #3 is very hazardous and cannot be seen when coming down hill; Adit #2 is partially caved approx. 10 feet back. Adit at WR-1 is open and contains standing water.

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_, Number 2, types and locations: WR-1 and WR-2 are steep, unvegetated talus slopes and easily dislodged.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_

## **Bibliography**

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Fisher Creek No. 1, Prepared by Chen-Northern, August 22, 1989.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1989.





LABORATORY ANALYTICAL DATA

FISHER CREEK NO. 1  
PA NO. 34-090



**Fisher Creek PA# 34-090**  
**AMRB HAZARDOUS MATERIALS INVENTORY**  
**INVESTIGATOR: PIONEER - BABITS**  
**INVESTIGATION DATE: 08/10/93**

**SOLID MATRIX ANALYSES**

FIELD ID	Metals in soils Results per dry weight basis													
	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-090-SE-1	16.3 J	104	0.76 U	17.6	19.8 J	1220	33900	0.092	885	21.2	59.6	9.12 UJ	159	NR
34-090-SE-2	10.7 J	76.4	0.80 U	14.6	13.9 J	1020	24600	0.641	515	17.6	54.5	9.58 UJ	121	NR
34-090-WR-1	207 J	228	3.26	3.07	1.17 U	449	65900	1.98	7.99	6.24	920	10.4 J	732	NR
34-090-WR-2	82.3 J	333	0.49 U	15.4	19.2 J	255	32900	0.055	673	25.5	213	5.8 UJ	188	NR
BACKGROUND	8.61 J	71.7	0.9	12.4 J	27	66.9	17100	0.019 J	461 J	23.9	28.3 J	5.49 U	69.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Acid/Base Accounting**

FIELD ID	TOTAL				SULFUR				PYRITIC				SULFUR			
	TOTAL SULFUR %	ACID BASE 1/1000	NEUTRAL POTENT. 1/1000	ACID BASE POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000	PYRITIC SULFUR ACID BASE POTENT. 1/1000	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000
34-090-WR-1	6.64	207	-3.57	-211	-211	3.01	90.9	-94.5	90.9	3.01	90.9	-94.5	-94.5	3.01	90.9	-94.5
34-090-WR-2DUF	0.27	8.43	4.15	-4.29	-4.29	0.14	0.94	3.21	0.94	0.14	0.94	3.21	3.21	0.14	0.94	3.21
34-090-WR-2	0.25	7.81	3.81	-4.00	-4.00	0.15	0.94	2.88	0.94	0.15	0.94	2.88	2.88	0.15	0.94	2.88

**WATER MATRIX ANALYSES**

FIELD ID	Metals in Water Results in ug/L														HARDNESS CALC.	
	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn			
34-090-GW-1	4.48 JX	40.6	2.57 U	9.7 U	6.83 U	23.4 JX	1610	0.27	102	12.7 U	5.68 J	30.7 U	36.6			75.8
34-090-GW-2	6.44 JX	38.5	2.67 J	9.7 U	6.83 U	37 JX	2190	0.23	107	34.8 J	9.21 J	30.7 U	65.9			67.2
34-090-SW-1	1.18 U	32.7	2.57 U	9.7 U	6.83 U	180	655	0.27	112	12.7 U	1.85 J	30.7 U	49.3			50.7
34-090-SW-2	1.18 U	34.6	2.57 U	9.7 U	6.83 U	169	647	0.12 U	102	12.7 U	1.86 J	30.7 U	43			48.6
34-090-SW-3	6.5	102	2.57 U	9.7 U	6.83 U	51.1	756	0.15	91.6	14.8	38.1 J	30.7 U	64			74.2

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

**Wet Chemistry  
Results in mg/l**

FIELD ID	TOTAL DISSOLVED SOLIDS				CHLORIDE				SULFATE				NO3/NO2-N CYANIDE			
	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N CYANIDE	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N CYANIDE	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N CYANIDE	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N CYANIDE
34-090-GW-1	110	8	72	0.3	110	8	72	0.3	110	8	72	0.3	110	8	72	0.3
34-090-GW-2	112	12	30	0.32	112	12	30	0.32	112	12	30	0.32	112	12	30	0.32
34-090-SW-1	89	10	47	0.14	89	10	47	0.14	89	10	47	0.14	89	10	47	0.14
34-090-SW-2	88	5	44	< 0.05	88	5	44	< 0.05	88	5	44	< 0.05	88	5	44	< 0.05
34-090-SW-3	89	5	17	< 0.05	89	5	17	< 0.05	89	5	17	< 0.05	89	5	17	< 0.05

**LEGEND**

- SE1 - Upgradient sediment sample in Fisher Creek.
- SE2 - Downgradient sediment sample in Fisher Creek.
- WR1 - Composite of subsamples WR1 and 2.
- WR2 - Sample of the WR4 subsample.
- BACKGROUND - From the Little Daisy Mine (34-009-SS-1).
- WR2DUP - Duplicate of the 34-009-WR-2 sample.
- GW1 - Groundwater in adit at waste rock dump 1.
- GW2 - Duplicate of sample GW1.
- SW1 - Same as sample SE1.
- SW2 - Same as sample SE2.
- SW3 - Adit discharge of waste rock dump 4.





XRF ANALYSIS RESULTS

FISHER CREEK NO. 1  
PA NO. 34-090



Mine Name: Fisher Creek #1 PA# 34-090

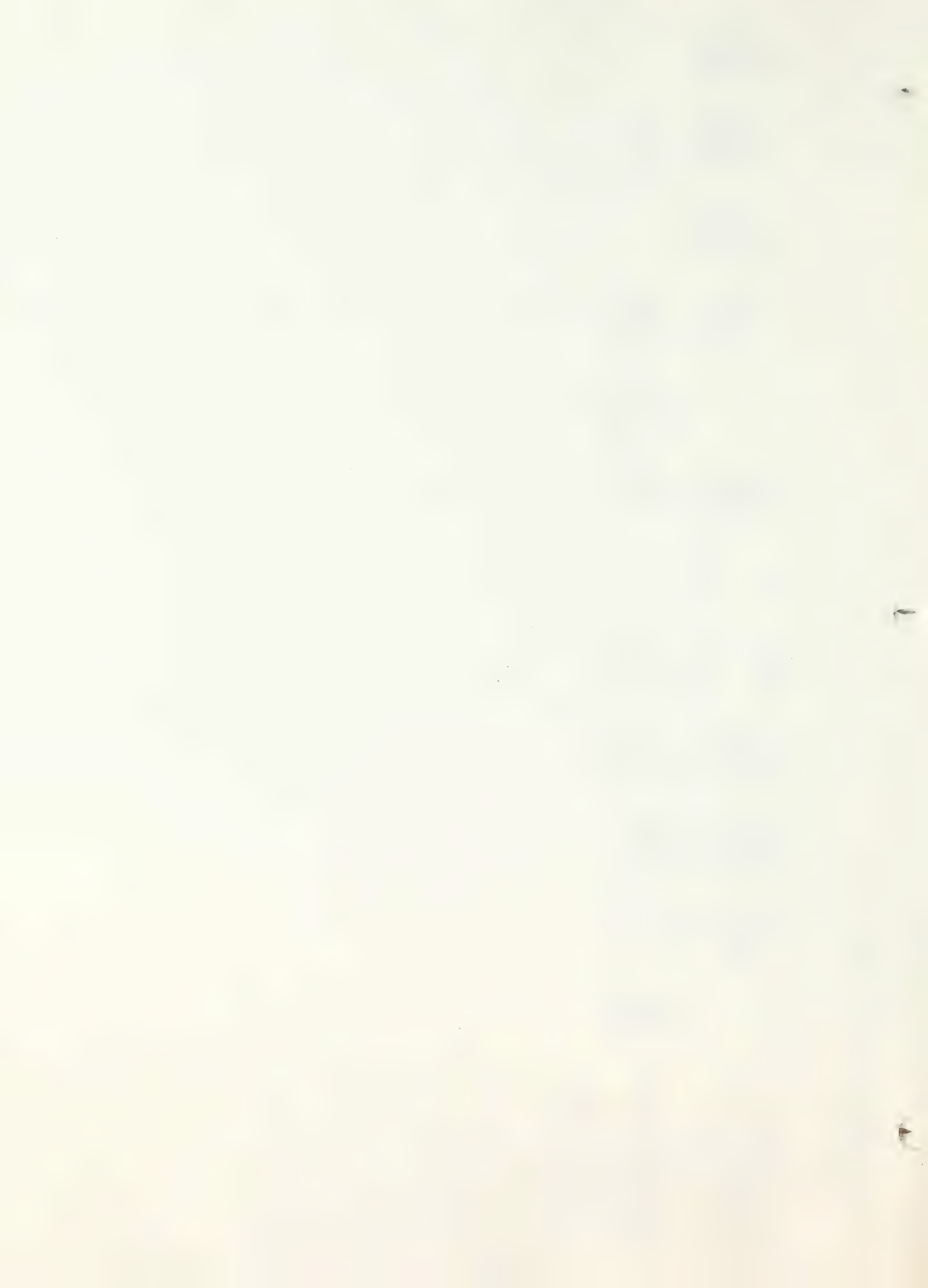
XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-090-WR-1		25556.7	1425.67	1586.84	177.873 *		41985.1		140.97 *	441.002	427.643	98.3818
34-090-WR-1-COMP		25425.3	1308.13	1188.81			39999.5		204.533	511.192	355.129	168.882
34-090-WR-2		22803.9	1211.63	914.021			48030.5		222.44	470.971	207.929 *	253.236
34-090-WR-4		15099.5	4220.18	1142.31	206.379 *	617.483 *	48619.5		325.706	255.446	118.045 *	297.561
34-090-WR-1	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
34-090-WR-1	266.39	37.9968 *	6.89394 *	996.872	75.7771		109.495 *	1222.74	163.095 *		11.9421 *	
34-090-WR-1-COMP	212.991		9.57659 *	1112.93	86.4155		94.9828 *	987.971	134.363 *		10.2677 *	
34-090-WR-2	81.6019	40.8345 *	13.9934 *	1734.11	77.2343		43.3474 *	2064.79	226.449 *			
34-090-WR-4	172.078			180.927	84.6371			889.664				

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

FISHER CREEK NO. 1  
PA NO. 34-090



# AIMSS SCORESHEET

SITE NAME: FISHER CREEK NO.1  
PA NUMBER: 34-090

LINE NO.		GROUNDWATER PATHWAY	PA NUMBER:	FISHER CREEK NO.	34-090
1		OBSERVED RELEASE			0
2		EXCEEDENCES			0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT			20
3B		GW DEPTH			10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B		200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C		200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)		3.124
6		WELLS - 1 MI. x 2.5			5.0
7	GW - TARGETS	WELLS - 1 TO 4 MI			95
8		NEAREST WELL			0
9		TARGETS SCORE	LINES 6 + 7 + 8		100.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9		62480
		SURFACE WATER PATHWAY			
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE			300
12		EXCEEDENCES			0
13A		CONTAINMENT			20
13B		DISTANCE TO SW			2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B		40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C		340
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)		3.519
16		DRINKING WATER POP'N			0
17		IMPACTED DRAINAGE			0
18	SW - TARGETS	WETLANDS			10
19		FISHERY			0
20		RECREATION			5
21		IRRIGATION/STOCK			0
22		T & E SPECIES HABITAT			5
23		TARGETS SCORE	SUM LINES 16 THRU 22		20
24		SURFACE WATER SCORE	LINES 14 x 15 x 23		23929
		AIR PATHWAY			
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE			0
26A		CONTAINMENT			1
26B		DISTANCE TO POPULATION			5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B		5
27		LIKELIHOOD SCORE	LINES 25 + 26C		5
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)		0.011
29		POPULATION - 4 MILES			30
30	AIR - TARGETS	NEAREST RESIDENCE			0
31		WETLANDS			0
32		PARKS / WILDERNESS			10
33		T & E SPECIES HABITAT			5
34		TARGETS SCORE	SUM LINES 29 THRU 33		45
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34		2
		DIRECT CONTACT PATHWAY			
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE			50
37A		ACCESSIBILITY			20
37B		DISTANCE TO POPULATION			5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B		100
38		LIKELIHOOD SCORE	LINES 36 + 37C		150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)		0.010
40	DIRECT CONTACT	POPULATION - 1 MILE			0
41	TARGETS	NEAREST RESIDENCE			0
42		RECREATIONAL USE			2
43		TARGETS SCORE	SUM LINES 40 THRU 42		2
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43		3
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE				
	(LINES 10 + 24 + 35 + 44) / 100,000				0.86

SITE NAME: FISHER CREEK NO.1  
PA NUMBER: 34-090

LINE  
NO.

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	150
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	150
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 THRU 11	2
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>6.00</b>





34-090, #20: WR-4



34-090, #21: WR-1 and WR-2





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: HOMESTAKE NO. 2 PA#: 34-093

Date: August 9, 1993 Time: 1615

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Clark, Pioneer

Visitors: Earl McCurley, MDSL

Weather/Seasonality Observations: Overcast; rain; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #2: WR-1A and -1B and tramway, facing south; #3: WR-1C and loadout, facing north with Lower Glengarry site in background; #4: Adit #1. Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): No background sample taken at this site; see Lower Glengarry (34-006). Recent trenching above tram station and adit at tram has been rehabilitated.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Reclamation is dependent on the success of Crown Butte Mines, Inc., in obtaining a permit. If it is not mined, grade, amend, and revegetate; close HMO and reclaim open trench cut.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): HOMESTAKE NO. 2 PA#: 34-093

Legal Description: T 9S ; R 14E ; Sec. 14 , NE1/4NW 1/4 1/4

County: PARK Mining District: NEW WORLD

Latitude: N 45° 03' 14" Longitude: W 109° 56' 50"

Primary Drainage Basin and Code: Clark Fork Yellowstone/10070006

Secondary Drainage Basin: Fisher Creek

USGS Quadrangle map name(s): Cooke City

Mine Type/Commodities: Hardrock/Copper, Gold

Activity Status: Active      , Inactive/Exploration X , Abandoned      .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): James Ross,  
Robert McQuade, and H.W. Jepson, Crown Butte Mines, Inc., 2812 1st  
Avenue N, Billings, MT 59101. (406) 245-3455; Margaret Reeb,  
Trustee, P.O. Box 301, Livingston, MT 59047. (406) 222-6739;  
Gallatin National Forest.

Relationship to other mines/sites in the area/district: Above Gold  
Dust Mine

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Possible work being done by New World  
Mining.

General site features: Elevation 10000' , Slope 27°-30° ,  
Aspect Northwest

Land use: Mining X , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 2 acres.  
Dimensions:     

Predominant vegetation types: Subalpine fir at timberline

Access: roads - good      , poor X , 4wd      , trail X .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 8 well logs within a 1 mile radius.  
All of the wells are monitoring wells for the Crown Butte Mines  
project.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site underlain by quartzite with igneous  
intrusions, lots of copper staining. Site lies on slope southwest  
of Fisher Creek. Water leaving the site would flow northeast to  
Fisher Creek and then southeast in perennial Fisher Creek to  
confluence with Clark Fork of Yellowstone River 2.5 to 3 miles  
away.

Mining/milling history, ore type/tenor, host rock, gangue: No  
information available.

#### Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment       
Pits - Yes X, No     , # 1, Comment Exploration trench  
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

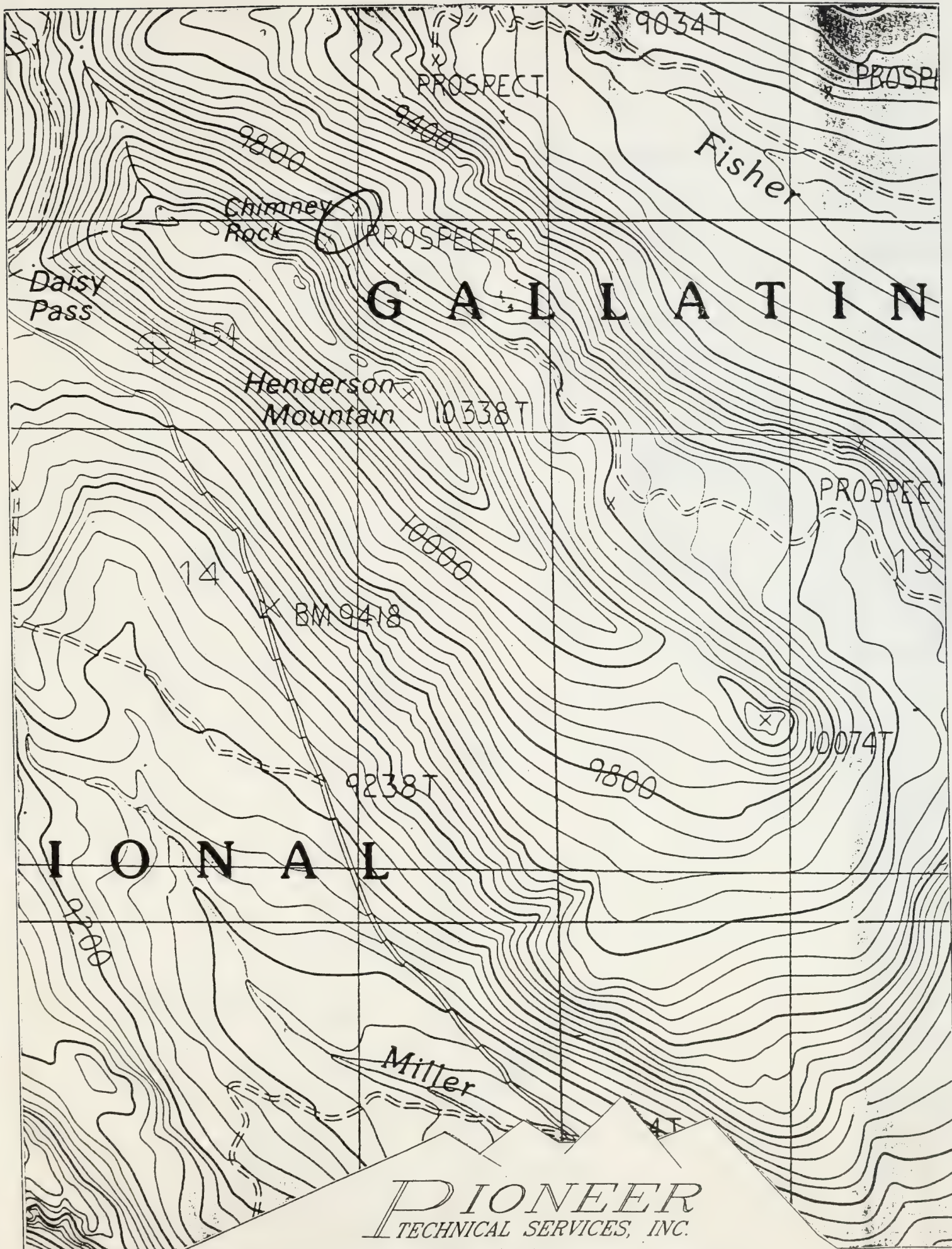
Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:130282	09S 14E 11 A	37.0	0.0	0.00
M:130283	09S 14E 11 A	60.0	0.0	0.00
M:8279	09S 14E 11 CB	0.0	0.0	11.60
M:130288	09S 14E 11 D	71.5	0.0	0.00
M:130284	09S 14E 11 D	45.5	0.0	0.00
M:130287	09S 14E 11 D	30.0	0.0	0.00
M:130290	09S 14E 11 D	12.5	0.0	0.00
M:130292	09S 14E 12 C	28.3	0.0	0.00





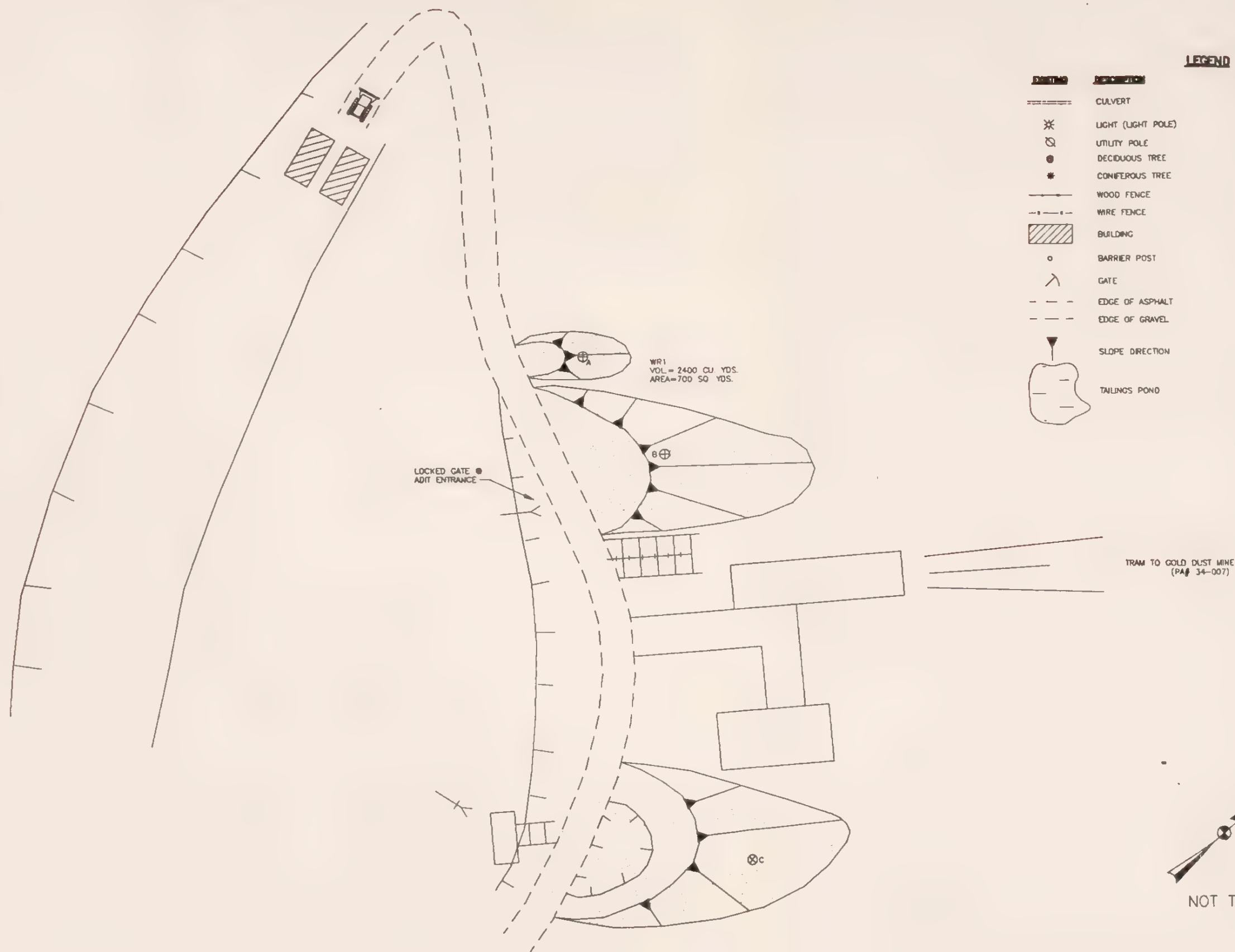


HOMESTAKE NO. 2, P.A. NO. 34-093

T09S, R14E, SECTION 14

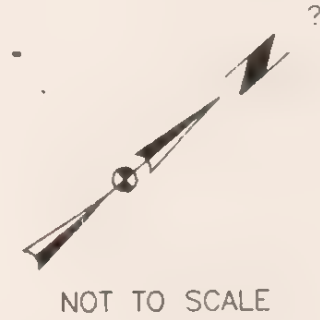
SCALE: 1" = 1000'





**LEGEND**

	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WASTE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARRIER POST		LAB SAMPLE
	GATE		XRF SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE GROUND AND SURFACE
	EDGE OF GRAVEL		DRAINAGE
	SLOPE DIRECTION		WATER WELL
	TAILINGS POND		PONDED WATER
			VEGETATED WET LANDS



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
HOMESTAKE #2 PA# 34-093  
NEW WORLD DISTRICT PARK COUNTY

**PIONEER**  
TECHNICAL SERVICES, INC. BUTTE MT.  
THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL MONTANA  
SPOKANE WASHINGTON

DRAWN JIP DATE 6 DEC 93  
DESIGNED TOP JOB NO. 93-17  
APPROVED WJB F.B. NO.







## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A



**SAMPLERS:** Bullock

[illegible]

**Comments or deviations from SOPs:** 34-093-WR-1 is a composite of WR-1A, WR-1B, and WR-1C.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;

Number of well logs: 113

Distance to nearest well used for drinking? Approx. 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible X, Unlikely\_\_\_.

Possible localized groundwater contamination could occur due to elevated metals concentrations and high precipitation.

Other observations/notes: N/A



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Dry streambeds: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Other surface water: Yes\_\_\_\_, No X, Name(s)/Description:\_\_\_\_\_

Waste materials within any floodplain: Yes\_\_\_\_, No X Source ID(s):\_\_\_\_\_

Approximate Flood frequency?\_\_\_\_1 yr,\_\_\_\_10 yr,\_\_\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow:\_\_\_\_\_, Average Flow:\_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)?  
N/A

Surface water draining onto or through waste sources: Yes\_\_\_\_, No X,  
Describe: Runoff only

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Yellowstone Park: fishery, recreation

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_,  
No X, Distance downstream (ft)?\_\_\_\_\_ Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present): \_\_\_\_\_



## SAMPLERS:

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH  $\leq$  5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 4 acres

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes , No X , Describe:

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_;  
100-300 X; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or  
greater\_\_\_\_; Comments\_\_\_\_\_

Nearest residence(ft or miles)? Approx. 2.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
----------	------	----------	-----	------



**SAMPLERS:** Bullock, Clark

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe:\_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe:  
Tourists

Accessibility - Fences, warning signs, closed roads? Unrestricted;  
hike to site.

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u>X</u> , No____, Comment <u>Yellowstone</u>
Wilderness Area -	Yes <u>X</u> , No____, Comment <u>Absaroka/Beartooth</u>
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Bald Eagle</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium____, Low <u>X</u>
Fisheries Habitat and Species Classification -	<u>6</u>
Sport Fishery Classification -	<u>6</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Adit

Hazardous structures: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Loadout and tram

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 1,  
types and locations: Highwall associated with exploration pit above the  
adit.

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_

## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Homestake No. 2, Prepared by Chen-Northern, August 22, 1989.

USGS, Topographic Map, Cooke City, Montana, 7 1/2 minute Quadrangle, 1989.





LABORATORY ANALYTICAL DATA

HOMESTAKE NO. 2  
PA NO. 34-093



Homestake #2 PA # 34-093  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-093-WR-1	16.7 J	71.7	0.6	10.3 J	21	1140	61200	0.378 J	1490 J	23.1	79.8 J	6.35 U	162	NR
BACKGROUND	8.61 J	71.7	0.9	12.4 J	27	66.9	17100	0.019 J	461 J	23.9	28.3 J	5.49 U	69.9 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE 1/1000	NEUTRAL. POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE 1/1000	SULFUR ACID BASE POTENT. 1/1000
34-093-WR-1	1.01	31.6	29.0	-2.52	0.02	0.32	0.67	10.0	19.0

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From the Lower Gbangary (34-006-SS-1).





**XRF ANALYSIS RESULTS**

**HOMESTAKE NO. 2  
PA NO. 34-093**



Mine Name: Homestake #2 PA# 34-093

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
34-093-WR1-A		12402.7	14712.8	1165.54	187.587 *	5027.02	134389		2226.05	363.7	54.7875 *	104.729
34-093-WR1-B		29158.7	3639.5	1480.06	153.228 *	885.809 *	36204.6		103.279 *	49.3417 *		259.048
34-093-WR1-C		15453.8	4540.94	1295.43		1861.95	65471.1		261.253	137.587 *	48.2481 *	281.282
34-093-WR-1-COMP		23970	8987.56	1912.76	218.88 *	2165.21	70261.8		1105.05	199.122	58.8451 *	329.023
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
34-093-WR1-A	102.974			51.1165 *	100.287	280.111 *		877.141			21.6183	
34-093-WR1-B	93.4205		4.29893 *		129.076			1217.6			19.1781	
34-093-WR1-C	116.899		6.44457 *	22.5069 *	92.024		55.5837 *	665.809	111.895 *		20.314	
34-093-WR-1-COMP	117.092				120.013			1169.37			19.7992	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

HOMESTAKE NO. 2  
PA NO. 34-093



# AIMSS SCORESHEET

SITE NAME: HOMESTAKE NO. 2  
PA NUMBER: 34-093

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	20.0
7	GW - TARGETS	WELLS - 1 TO 4 MI	105
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD	EXCEEDENCES	0
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	0
19	SW - TARGETS	FISHERY	0
20		RECREATION	5
21		IRRIGATION/STOCK	0
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 THRU 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	10
26B	OF RELEASE	DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	100
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	0
32		PARKS / WILDERNESS	10
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 THRU 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF	ACCESSIBILITY	20
37B	EXPOSURE	DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT	POPULATION - 1 MILE	0
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	10
43		TARGETS SCORE	SUM LINES 40 THRU 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		0.00
	(LINES 10 + 24 + 35 + 44) / 100,000		

SITE NAME:  
PA NUMBER:

HOMESTAKE NO. 2  
34-093

LINE  
NO.

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	205
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 THRU 11	10
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	41.00





34-093, #2: WR-1A, WR-1B and tramway, facing south



34-093, #3: WR-1C and loadout, facing north



34-093, #4: Adit #1













MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: CHARTER OAK PA#: 39-003

Date: June 11, 1993 Time: 0830

Field Team Leader: Bullock/Babits, Pioneer

Sampling Personnel: Flammang, Lasher, Clark;  
Pioneer  
Pierson; TD&H

Visitors: Earl McCurley, MDSL

Weather/Seasonality Observations: Partly cloudy; slight breeze;  
scattered showers in the afternoon.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #17: WR-2; #18: WR-  
3; #19: Open stope above WR-1; #20: WR-1; #21: Adit and WR-4; #22:  
WR-5; #23: SW-1; #24: Collapsed adit at WR-6; #25: WR-6; #26:  
Runoff pattern on east end of site; #27: Adit at WR-8; #28: WR-8  
and drainage; #29: Adit and WR-7; #30: WR-7; #31: Adit at WR-9.  
Roll #2: #15: Close up of Adit #1 and discharge, GW-1 sample  
location; #16: Same as photo #15, but full view; #17: Adit #2 above  
mill, GW-2 sample location; #18: SW-1 and SE-1 sample location-  
outlet from tails location; #19: SE-2 sample location downstream;  
#20: SE-3 sample location. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms):   
Very high XRF readings for arsenic in the waste rock and tails.  
New adit has extremely low pH discharge.

Other Hazardous Materials/Substances Present: Seven 5 gal. buckets  
of waste oil (open); five 55 gal. barrels of unknown (floor was  
unsafe to inspect closely); one 20 gal. barrel of muriatic acid  
(full); one 5 gal. tub of unknown white powder; sprayer equipment  
possibly used for CN- application; empty NaCN barrels present; one  
roll of Primacord; one 30 gal. barrel 3/4 full and bulging (unknown  
content).

General Comments on Potential Remedial Alternatives: Study water  
treatment requirements and alternatives. Isolate tailings from  
wetlands and shallow groundwater. Grade, contour, amend and  
revegetate wastes.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): CHARTER OAK PA#: 39-003

Legal Description: T 9N ; R 7W ; Sec. 36 , SW1/4 NE1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 29' 25" Longitude: W 112° 25' 10"

Primary Drainage Basin and Code: Little Blackfoot River/17010201

Secondary Drainage Basin: Little Blackfoot River

USGS Quadrangle map name(s): Bison Mountain

Mine Type/Commodities: Hardrock/Lead, Zinc, Copper, Silver, Gold

Activity Status: Active     , Inactive/Exploration X , Abandoned     .

Ownership status: Known YX N ; private/public? Private/Public

Owner, Agent, or Contact (Include address and phone when available): Mary Ann Stowe,  
c/o Michael Stowe, 3000 Villard #127, Helena, MT 59601.

(406) 442-0619; Helena National Forest.

Relationship to other mines/sites in the area/district: This site  
is not directly related to other mines in the area.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Currently under evaluation by the  
USFS.

General site features: Elevation 5600'-5700' , Slope 5°-45° ,  
Aspect Northwest

Land use: Mining X , Recreational X , Residential     , Urban     ,  
Agricultural     , Other (Specify)    

Area of disturbed/unvegetated lands? 25 acres.  
Dimensions: Tailings pond 210 feet x 345 feet; waste dumps 900  
feet x 1,100 feet

Predominant vegetation types: Lodgepole pine, Douglas fir, willow,  
cottonwoods

Access: roads - good X , poor     , 4wd     , trail     .  
Other logistical considerations (proximity to other sites). Locked  
gate 1/4 mile from the mill

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MDMG Well Log Printout(s): There are 8 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Mine is in Cretaceous volcanics which  
were intruded by quartz monzonite of the Boulder Batholith. The  
Blackfoot River runs in a northeasterly direction at the base of  
the site.

Mining/milling history, ore type/tenor, host rock, gangue: Total  
ore produced from 1916 to 1966 was 9,127 tons of ore yielding 382  
oz. Au, 39,146 oz. Ag, 10,041 lbs. Cu, 672,046 lbs. Pb, and 168,270  
lbs. Zn. Mineralization occurs as vein fillings in andesite; all  
occur as grains disseminated in a quartz gangue. Minerals include  
argentiferous galena, boulangerite (Pb, Sb sulfide), arsenopyrite,  
pyrite, and sphalerite. Exploration has occurred since 1966, with  
some adits being reconditioned in 1988.

Mine Operation?

Shafts - Yes X, No    , # 1, Comment Collapsed  
Adits - Yes X, No    , # 6, Comment 3 open  
Pits - Yes    , No X, #    , Comment      
Placers - Yes    , No X, #    , Comment      
Other - Yes    , No X, #    , Comment    

Mill Operation? Yes X, No    . If yes answer the next three  
questions:

Period(s) of Operation: 1916 to 1927; unknown

Origin of Ore Milled - Custom Mill     Dedicated Mill X; Number and  
names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
CN- vat and possible heap leach

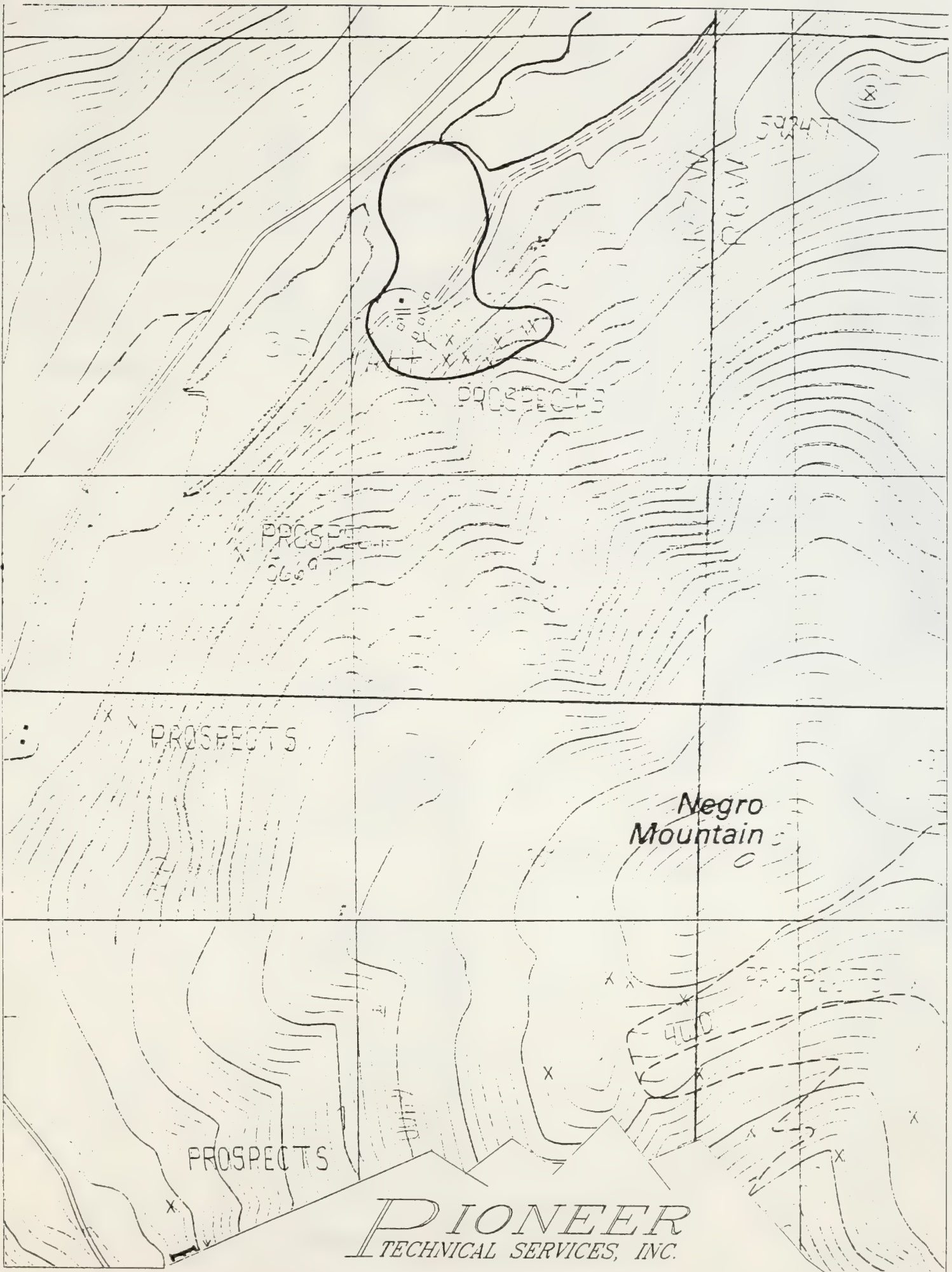
Montana Bureau of Mines and Geology  
Water Well Log Data

10/15/1993

Well No.	Location	Depth	Yield	Static Water Level
M:59258	09N 07W 35	149.0	29.0	73.00
M:59203	09N 06W 30	75.0	15.0	40.00
M:59204	09N 06W 30 AB	0.0	0.0	62.00
M:59205	09N 06W 30 B	61.0	15.0	5.00
M:131825	09N 06W 30 CAC	58.0	35.0	13.00
M:57351	08N 07W 01 B	41.0	30.0	4.00
M:57353	08N 07W 02 A	40.0	50.0	30.00
M:57352	08N 07W 02 A	380.0	2.0	50.00







*PIONEER*  
TECHNICAL SERVICES, INC.

CHARTER OAK, P.A. NO. 39-003

T09N, R07W, SECTION 36

SCALE: 1" = 1000'









## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution(approximate % sand, silt, & clay): Medium sand to fine-grained light silty sand

Determine tailings impoundment depth and describe stratification of the tailings if observable(based on texture and color): 10' in deepest location that had been leached; 6' to 1' working out from leached area.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Near surface to 2' moist; wet near bottom.

Describe condition of the tailings impoundment(Note condition of dams or structures, location of breaches): No impoundment, but runoff flows through a series of beaver ponds (wetlands) prior to discharging to the Little Blackfoot.

Comments on potential for mitigation: Consolidation and isolation or removal

# SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammang\*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAIN- MENT	pH SU (D/S)*	RADIO- ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A	TAIL	6,000	High bermed area of pond; 0'-1.5', brown/orange silty sand	Berm made of tailings	< 3.5 (D)	0.07	39-003-TP-1	06/11/93 1240	T-Metals, ABA, CN-
TP-1B	TAIL		High bermed area of pond; 1.5'-5.5', light gray/green silty sand	Berm made of tailings	< 3.5 (D)	0.06			
TP-1C	TAIL		High bermed area of pond; 5.5'-7.0', dark gray silty sand	Berm made of tailings	< 3.5 (D)	0.04			
TP-1E	TAIL		High bermed area of pond; dark gray silty sand with pyrite	Berm made of tailings	< 3.5 (D)	0.04			
TP-2A	TAIL		West of bermed area; 4.3'-6', medium tan sand	None	< 3.5 (D)	0.04	39-003-TP-2	06/11/93 1240	T-Metals, ABA, CN-
TP-2B	TAIL		West of bermed area; 6.5', underlying soil	None	< 3.5 (D)	0.04			
TP-2C	TAIL		West of bermed area; 2.5'-4.5', saturated gray sandy clay	None	< 3.5 (D)	0.04			
TP-3	TAIL		Outlying tailings; 0'-1', white silty sand	None	< 3.5 (D)	0.04			

\*Direct reading (Felsky Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: Bermed area in tailings may have been used for CN- leaching; total depth is 9.5' at borehole location. 39-003-TP-1 is composite of TP-1A, TP-2A, and TP-3. 39-003-TP-2 is composite of TP-1C and -1E, and TP-2C.

\*Continued on next page



# SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Babits, Pierson

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1	WR	14,000*	Associated with open stope tan/gray/orange sandy loam with rock; moist	None	< 3.5 (D)	0.06	39-003-WR-1	06/11/93 1650	T-Metals, ABA
WR-2A	WR	2,000	East side; tan moist coarse sand	None	5.2 (D)	0.05	39-003-WR-2	06/11/93 1525	T-Metals, ABA
WR-2B	WR		Near middle and top; brown moist coarse sand associated with shaft	None	6.8 (D)	0.04			
WR-3	WR	135	By ore chute; tan dry sand	None	6.2 (D)	0.05	39-003-WR-3	06/11/93 1700	T-Metals, ABA
WR-4	WR	14,000*	North of Adit #4; tan/orange/gray sandy loam	None	< 3.5 (D)	0.04			
WR-5	WR	14,000*	North of Adit #5; brown sandy loam	None	6.0 (D)	0.06			
WR-6	WR	30	West of Adit #6; red sand	None	6.8 (D)	0.03			
WR-7	WR	1,600	Northe end of WR-7; white with copper staining	None	3.8 (D)	0.06			
WR-8	WR	600	North end of WR-8; gray rock	None	< 3.5 (D)	0.04			
WR-9	WR	500	North end of WR-9; green clay	None	< 3.5 (D)	0.04			
SS-1	BKGRND	N/A	Background soil	N/A	N/A	N/A	39-003-SS-1	06/11/93 1245	T-Metals

\*Direct reading(Radiac Meter), S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: \*Volume includes WR-1, -4, and -5. 39-003-WR-1 is composite of WR-1, -4, and -5. 39-003-WR-2 is composite of WR-2A and -2B. 39-003-WR-3 is composite of WR-3, -6, -7, -8, and -9.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 2 Identification: Locations  
of GW-1 and -2 as identified on map

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes    , No X, Number:     Identification:    

Groundwater wells within 4 miles?: Yes X, No    ;  
Number of well logs: 107

Distance to nearest well used for drinking? Nearest downgradient well  
is 4,200' downstream at the Lion's Sunshine Camp. Well was sampled as  
GW-3 by Earl McCurley, MDSL/AMRB.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh  
(meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite X, Probable    , Possible    , Unlikely    .

Low pH and high SC values strongly indicate contamination - lab  
results verify elevated metals levels.

Other observations/notes: N/A



**SAMPLERS:** Bullock, Flammanq

FLOW: Estimated (E) or Measured (M) from edit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Earl McCurley, MDSL/AMRB, collected  
39-003-GW-3.

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Little Blackfoot River and unnamed intermittent tributary southwest of the mill

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes X, No     , Name(s)/Description: Pond at east end of tailings discharges to Little Blackfoot River via a series of beaver ponds.

Waste materials within any floodplain: Yes X, No      Source ID(s): Tailings

Approximate Flood frequency?      1 yr, X 10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 125 est. during sampling  
High Flow: Approx. 140 cfs, Average Flow: 15 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; Tailings and waste rock

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Intermittent drainage passes through several mine dumps. Tailings wash into pond area.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, fishery, wetlands, stock watering

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)?      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Pond and wetlands appear impacted - stressed vegetation. No impacts obvious to the Little Blackfoot River.



**SAMPLERS:** Babits - SW-1; Bullock, Flammang - SE-1, 2, 3

**SAMPLERS:** Babits - SW-1; Bullock, Flammang - SE-1, 2, 3

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No surface water samples collected from the Little Blackfoot River due to the Q being greater than 500 times the discharge from the beaver ponds area.

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 100 acres could be developed into a wetlands treatment area.

Wetlands present: Yes X, No    , Describe: Wetlands around parameter of tailings and in beaver ponds.

Carbonate rocks/soils: Yes X, No    , Describe: Babits reports limestone present in WR-7. High pH's in upgradient water and Adit #2 also indicates presence.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10    ; 10-30    ; 30-100 X; 100-300    ; 300-1,000    ; 1,000-3,000    ; 3,000-10,000    ; 10,000 or greater    ; Comments    

Nearest residence(ft or miles)? 3,000 feet

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Flammang, Babits, Pierson

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/NO DATE/Low/NONE)
TP-1	SO3; FEOX; VEG; pH	Partial	32,760*	32,760	Yes	Moderate
TP-2	SO3; FEOX; VEG; pH	Partial			Yes	Moderate
TP-3	SO3; FEOX; VEG; pH	Partial			Yes	Moderate
WR-1	SO3; FEOX; pH	Dry	162,450*	162,450	Yes	Moderate
WR-2	None	Partial	46,300	46,300	No	Low
WR-3	None	Dry	2,000	2,000	Yes	Moderate
WR-4	SO3; FEOX; pH	Dry			Yes	Moderate
WR-5	None	Dry			Yes	Moderate
WR-6	FEOX	Dry	3,300	3,300	Yes	Moderate
WR-7	FEOX; pH	Partial	30,300	30,300	No	Low
WR-8	FEOX; pH	Partial	6,750	6,750	No	Low
WR-9	SPG; FEOX; pH	Wet	6,435	6,435	Yes	Low

Notes and Clarifications: \*Surface area for TP-1 includes TP-2 and TP-3; surface area for WR-1 includes WR-4 and WR-5.

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No \_\_\_\_\_,  
Describe:

Population within 1 mile: 1-10 X; 10-30   ; 30-100   ; 100-300   ;  
300-1,000   ; 1,000-3,000   ; 3,000-10,000   ; 10,000 or greater   ;  
Comments   

Evidence of recreational use on site: Yes ☐ , No ☒ , Describe:

Accessibility - Fences, warning signs, closed roads? Locked gate and "No Trespassing" sign

**Sensitive environments on-site or adjacent to site:**

State or National Parks - Yes     , No X, Comment                       
 Wilderness Area - Yes     , No X, Comment                       
 T&E Species Habitat - Yes X, No     , Comment Bald Eagle  
 Bat Habitat - Yes X, No     , Comment Adits

Primary Drainage ; Secondary Drainage X ; No Information :

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 3  
Sport Fishery Classification - 3

## G. SAFETY CHARACTERISTICS

## Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No     , Number 3, types and locations:       
Adits

Hazardous structures: Yes\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
Buildings have been kept in good repair.

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_, No X, Number\_\_\_,  
types and locations:

Unstable waste piles, impoundments, undercut banks: Yes X, No     ,  
Number 4, types and locations: WR-1, -2, -4, and -5 are very steep.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: No explosives  
found other than the Primacord.



## Bibliography

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- MDHES/WQB, Analytical Data for Charter Oak, May 20, 1977.
- MDSL/AMRB, Environmental Assessment Analytical Data for Charter Oak, Prepared by MSE, Inc., October 29 and November 15, 1990.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Charter Oak, Prepared by Northern Engineering and Testing, June 15, 1988.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Charter Oak, Prepared by Robert Peccia and Associates, October 17, 1990.
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- Robertson, Forbes Smith, Geology and Mineral Deposits of the Elliston Mining District, Powell County, Montana, Thesis Written for the University of Washington, 1956.
- USBM, Metalliferous Deposits of the Greater Helena Mining Region, Montana, Bulletin 842, Written by J.T. Pardee and F.C. Schrader, 1933.
- USGS, Topographic Map, Bison Mountain, Montana, 7 1/2 minute Quadrangle, 1985.





LABORATORY ANALYTICAL DATA

CHARTER OAK  
PA NO. 39-003



Charter Oak PA# 39-003  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/11/93

SOLID MATRIX ANALYSES

Results per dry weight basis, mg/kg

Metals in soils

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CYANIDE
39-003-SE-1	44	26.2	1.6 J	4.9	13.9	8.1	10300	0.026 JX	199 J	8	31	5 UJ	261 J	0.16
39-003-SE-2	107	44.7	0.6 U	6	17.5	12.1	14600	0.032 JX	291 J	13	74	5 J	156 J	NR
39-003-SE-3	81	66	0.5 U	5.8	15.8	10.7	14000	0.025 JX	397 J	8	82	5 J	150 J	NR
39-003-TP-1	14500	54	1.7 J	2.7	7.5	198	48700	0.375 JX	71.3 J	2 U	3670	131 J	314 J	NR
39-003-TP-2	63700	22.4	61 J	9.7	1.8	318	111000	0.365 JX	30.5 J	2 U	18200	843 J	6650 J	NR
39-003-WR-1	2650	62.6	1.8 J	1.2 U	2.4	34.8	27000	0.361 JX	124 J	2 U	1960	71 J	244 J	NR
39-003-WR-2	13500	55.2	1 J	1.2 U	1.6	144	26700	0.984 JX	28.3 J	2 U	12300	113 J	233 J	NR
39-003-WR-3	2930	20.4	2 J	1.3	5	50.3	34200	0.329 JX	142 J	3	4100	284 J	72 J	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE v/1000t	NEUTRAL POTENT. v/1000t	SULFUR ACID BASE POTENT. v/1000t	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC ACID BASE v/1000t	SULFUR ACID BASE POTENT. v/1000t	LEGEND
39-003-TP-1	2.97	92.8	-7.8	-101	0.54	1.98	0.45	61.9	-69.7	SED1 - At PPE.
39-003-TP-2	13.8	430	-5.9	-436	0.79	6.25	6.72	195	-201	SED2 - Downstream of PPE on Little Blackfoot River.
39-003-WR-1	1.8	56.2	-1.5	-58	1.73	<0.01	0.07	0	-1.52	SED3 - Upstream of PPE on Little Blackfoot River.
39-003-WR-2	1.01	31.6	-3.5	-35	0.86	<0.01	0.15	0	-3.5	TP1 - Composite of subsamples TP1A, 2A, and 3.
39-003-WR-3	5.06	158	-3.3	-161	0.2	3.14	1.72	98.1	-101	TP2 - Composite of subsamples TP1C, 1E, and 2C.
39-003-WR-3DUP	5.08	159	-4	-163	0.24	3.14	1.7	98.1	-102	WR1 - Composite of subsamples WR1, 4, and 5.
										WR2 - Composite of subsamples WR2A and 2B.
										WR3 - Composite of subsamples WR3, 6, 7, 8, and 9.
										BACKGROUND - From the Charter Oak Mine (39-003-SS-1).
										WR3DUP - Duplicate of sample 39-003-WR-3.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Results in ug/L

Metals in Water

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	Hardness Calc. (mg CaCO3/L)
39-003-GW-1(TM)	41900	10	140	40.1	5 U	2370	233000	0.12 J	2610	33.3	440 J	148	14500	406
39-003-GW-1A(DM)	16100	10.2	73.1	18.8	6.83 U	1180 J	120000	0.13 J	1930	18.3 J	127 J	30.7 U	8160 J	400
39-003-GW-1A(TM)	24100	10.5	97.5	25.1	6.83 U	1520 J	162000	0.12 U	2350	19.2 J	256 J	42.5	10500 J	419
39-003-GW-2(TM)	196	9.13	2.55 U	5.99 U	5 U	1.35 U	3270	0.11 J	2290	8.78 U	1.31 J	18.3 U	421	593
39-003-GW-3(TM)	10.9 J	5.37	2.57 U	9.7 U	6.83 U	3.23 J	128	0.181	6.87	12.7 U	1.57	30.7 U	50	53.7
39-003-GW-3(DM)	8.73 J	4.8	2.57 U	9.7 U	6.83 U	3.3 J	100	0.118 U	9.8	12.7 U	0.72 U	30.7 U	68.3	52.5
39-003-SW-1(TM)	20.1	7.3	2.55 U	5.99 U	5 U	1.5	182	0.077 J	31.4	8.78 U	2.18 J	18.3 U	46.4	72.9
39-003-SW-2(TM)	10.4	2.24 U	2.55 U	5.99 U	5 U	1.35 U	154	0.11 J	2.6 U	8.78 U	2.16 J	18.3 U	6 U	44.3

Wet Chemistry Results in mg/l

Field ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-003-GW-1	1720	< 5.0	1020	< 0.05	NR
39-003-GW-2	804	< 5.0	363	< 0.05	NR
39-003-SW-1	113	< 5.0	33	< 0.05	0.02
39-003-SW-2	95	< 5.0	21	< 0.05	NR

LEGEND

GW1(TM) - Adit discharge associated with waste rock dump 9, Total metals.  
GW1A(DM) - Same location, yet filtered and sampled for dissolved metals.  
GW1A(TM) - Same location, sampled for total metals.  
GW2(TM) - Adit directly above old mill building - total metals.  
GW3(TM) - Well at Sunshine Kiawanas camp - total metals.  
GW3(DM) - Same location, yet filtered and sampled for dissolved metals.  
SW1(TM) - PPE - Beaver pond discharge - total metals.  
SW2 - Background and water quality sample - total metals

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested





**XRF ANALYSIS RESULTS**

**CHARTER OAK  
PA NO. 39-003**



\* -- Estimated Quantity  
\$ -- Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

CHARTER OAK  
PA NO. 39-003



# AIMSS SCORESHEET

SITE NAME:

CHARTER OAK

PA NUMBER:

39-003

LINE NO.				
<b><u>GROUNDWATER PATHWAY</u></b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	808.878
6		WELLS - 1 MI. x 2.5		20.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		99
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	129.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>41738105</b>
<b><u>SURFACE WATER PATHWAY</u></b>				
11		OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A	SW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	823.388
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		5
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	22
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>7245814</b>
<b><u>AIR PATHWAY</u></b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.976
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		5
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	50
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>49880</b>
<b><u>DIRECT CONTACT PATHWAY</u></b>				
36		OBSERVED EXPOSURE		200
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	250
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.575
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	6
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>14363</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			
		(LINES 10 + 24 + 35 + 44) / 100,000		<b>490.48</b>

LINE NO.				SITE NAME:	CHARTER OAK
				PA NUMBER:	39-003
	<b>SITE SAFETY</b>				
1	THREAT	ACCESSIBILITY			5
2	HAZARDS	OPEN SHAFTS	100 EA.		0
3		OPEN ADITS	50 EA.		150
4		UNSTAB. HIWALLS / PITS	75 EA.		0
5		HAZ. STRUCTURES	40 EA.		0
6		EXPLOSIVES			0
7		HAZ. MATERIALS			100
8		HAZARDS SCORE	SUM LINES 2 THRU 7		250
9	TARGETS	POPULATION - 1 MILE			1
10		NEAREST RESIDENCE			5
11		RECREATIONAL USE			0
12		TARGETS SCORE	SUM LINES 9 THRU 11		6
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000		7.50



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

STATE HEALTH DEPT.

WATER QUALITY BUREAU

HELENA, MONTANA 59601

STATE MONTANA

COUNTY POWELL

LAT.-LONG. 462943N 11225 9W

SAMPLE LOCATION 9N 7W 36ABC

STATION CODE

ANALYSIS NUMBER 77W0908

DATE SAMPLED 05-20-77

DRAINAGE BASIN 076G -CLARK FK R

TIME SAMPLED 1300

WATER FLOW RATE 49.15CFS(M)

METHOD SAMPLED GRAB

FLOW MEASUREMENT METHOD GURLEY METER

SAMPLE SOURCE STREAM

ALTITUDE OF LAND SURFACE

WATER USE MULTIPLE

TOTAL WELL DEPTH BELOW LS

AQUIFER(S)

SWL ABOVE(+) OR BELOW LS

SAMPLED BY WQBH

SAMPLE DEPTH BELOW SURFACE

SAMPLING SITE: LITTLE BLACKFOOT BELOW CHARTER OAK MINES

MG/L

MEQ/L

MG/L

MEQ/L

CALCIUM (CA)

BICARBONATE (HCO3)

MAGNESIUM (MG)

CARBONATE (CO3)

SODIUM (NA)

CHLORIDE (CL)

POTASSIUM (K)

SULFATE (SO4)

IRON (FE)

FLUORIDE (F)

MANGANESE (MN)

PHOSPHATE (PO4 AS P)

ALUMINUM (AL)

NO3+NO2 (TOT AS N)

9.0

0.187

SUM CATIONS

0.0

0.0

SUM ANIONS

9.000

0.187

LABORATORY PH

7.40

TOT HARDNESS (MG/L-CACO3)

FIELD WATER TEMPERATURE (C)

5.0

TOT ALKALINITY (MG/L-CACO3)

SUM-DISS. IONS MEAS. (MG/L)

LABORATORY TURBIDITY (JTU)

LAB CONDUCTIVITY-UHROS-25C

85.0

SODIUM ADSORPTION RATIO

A D D I T I O N A L

P A R A M E T E R S

LEAD, TR (MG/L AS PB)

&lt; 0.05

IRON, TR (MG/L AS FE)

.06

CADMIUM, TR (MG/L AS CD)

&lt; 0.005

COPPER, TR (MG/L AS CU)

&lt; 0.01

ZINC, TR (MG/L AS ZN)

&lt; 0.01

MANGANESE, TR (MG/L AS MN)

&lt; 0.01

ARSENIC, TR (MG/L AS AS)

.009

SILVER, TR (MG/L AS AG)

&lt; 0.01

REMARKS: BOULDER BATHOLITH 0662 CHARTER OAK MINE ACTIVE

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER  
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
 (M)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 04 SAMPLER DP HANDLING 3201 ANALYST LAB LAB WQBH  
 COMPLETED 08-11-77 COMPUTER RUN 08/29/77 DATA 0975/PROG 0876 FUND 0662  
 STNO DEV. ION BALANCE 2.05 CA MG NA K CL SO4 HCO3 CO3 NO3  
 SEGMENT MPDES 0.0 0.0 0.0 0.0 0.0100.0 0.0 0.0 0.0  
 CALC. MEQ/L= INSUFFICIENT DATA 77W0908

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Charter Oak Tailings--08/24/90

LAB NO: S2689

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.36 SU

Total Metals

As 3010 mg/Kg

Cd 1 mg/Kg

Cu 108 mg/Kg

Fe 13.900 mg/Kg

Pb 1560 mg/Kg

Zn 63 mg/Kg

DATE: November 15, 1990

CLIENT: Abandoned Mines

FIELD ID: Charter Oak Stream Above Dump

LAB NO: W8859

DATE RECEIVED: 10/18/90

Hardness 47 mg/L as  $\text{CaCO}_3$

Total Metals

As <0.1 mg/L

Cd <0.005 mg/L

Cu <0.02 mg/L

Fe <0.03 mg/L

Pb <0.07 mg/L

Zn <0.01 mg/L



DATE: November 15, 1990

CLIENT: Abandoned Mines

FIELD ID: Charter Oak Dump Drainage

LAB NO: W8861

DATE RECEIVED: 10/18/90

Hardness 128 mg/L as  $\text{CaCO}_3$

Total Metals

As 1.7 mg/L

Cd <0.005 mg/L

Cu <0.02 mg/L

Fe 7.55 mg/L

Pb 0.28 mg/L

Zn 1.35 mg/L

DATE: November 15, 1990

CLIENT: Abandoned Mines

FIELD ID: Charter Oak Lower Adit Discharge

LAB NO: W8860

DATE RECEIVED: 10/18/90

Hardness 601 mg/L as  $\text{CaCO}_3$

Total Metals

As 0.3 mg/L

Cd <0.005 mg/L

Cu <0.02 mg/L

Fe 5.14 mg/L

Pb <0.07 mg/L

Zn 0.67 mg/L

PREPARED \_\_\_\_\_  
CHECKED \_\_\_\_\_  
FILE \_\_\_\_\_  
PROJECT \_\_\_\_\_  
SUBJECT \_\_\_\_\_



**INC.**

Corporate Office  
P.O. Box 4078  
Butte, MT 59702  
(408) 723-8213

Laboratory  
108 S. Parkmont  
Butte, MT 59701  
(408) 494-1502

Idaho Falls Office  
381 Shoup Ave. Suite 201  
Idaho Falls, ID 83402  
(208) 523-1171

Component Development and  
Integration Facility (CDIF)  
P.O. Box 3787  
Butte, MT 59702  
(408) 494-7100  
FTS 587-7100

BILL - USFS Preliminary Assessment Support Data  
CHARTER OAK, SAMPLE DATE: 10/13/93, WATER

SAMPLE	Q (gpm)	T (C)	pH	SPCOND @ 25°C
GLW-1	2.3	5.0	2.95	1704
SW1-1	0	9.0	5.59	114
SW3-1	ND	6.1	6.13	104
SW4-1	ND	6.5	5.57	103

### TAILINGS

CO-S1 24-30" Dark gray (reduced) sand, moist

CO-S2 30-36" Dark gray (reduced) clay, moist

Both tailings are from the "upper" portion of the tailings impoundment.

Sample SW4 is within the Little Blackfoot, just downstream from the confluence with the Beaver Pond discharge (SW3). I'm not certain that SW4 is in the exact same location as your sample. We stumbled around along the Little Blackfoot for quite a ways; we collected the sample at our best judgment of where you probably collected yours.

Bill 10/18/93

REPORT DATE: November 3, 1993


CLIENT: USFS Charter Oak

DATE SAMPLED: 10-13-93

DATE RECEIVED: 10-14-93

Cyanide Analysis

FIELD ID	MSE, INC. LAB NO.	CN
CO-SW1-1	WM225	<0.005 mg/L
CO-SW3-1	WM226	<0.005 mg/L
CO-SW4-1	WM227	<0.005 mg/L
CO-S-1	S6132	<0.264 mg/Kg
CO-S-2	S6133	<0.315 mg/Kg

  
\_\_\_\_\_  
Review



REPORT DATE: November 3, 1993

CLIENT: USFS Charter Oak

FIELD ID: CO-GW1-1

LAB NO: WM228

DATE SAMPLED: 10-13-93

DATE RECEIVED: 10-14-93

Total Metals

Sb 0.06 mg/L

As 21.5 mg/L

Ca 146 mg/L

Cd 0.088 mg/L

Cu 1.32 mg/L

Ag <0.003 mg/L

Fe 147 mg/L

Pb 0.21 mg/L

Mg 15.3 mg/L

Mn 2.42 mg/L

Zn 9.74 mg/L

GFW  
Review



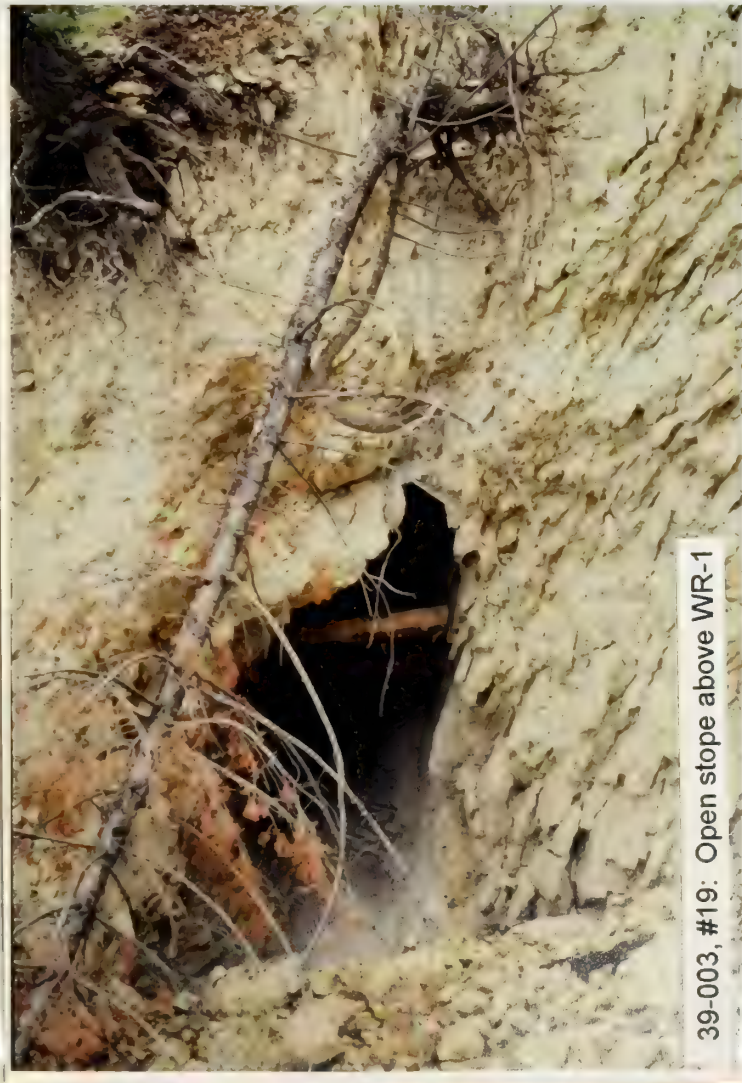




39-003, #17: WR-2



39-003, #18: WR-3



39-003, #19: Open slope above WR-1



39-003, #20: WR-1





39-003, #21: WR-4



39-003, #22: WR-5



39-003, #23: SW-1 sample location



39-003, #24: Collapsed adit at WR-6





39-003, #25: WR-6  
sample location



39-003, #26: Drainage off site towards Little Blackfoot



39-003, #27: Adit at WR-8

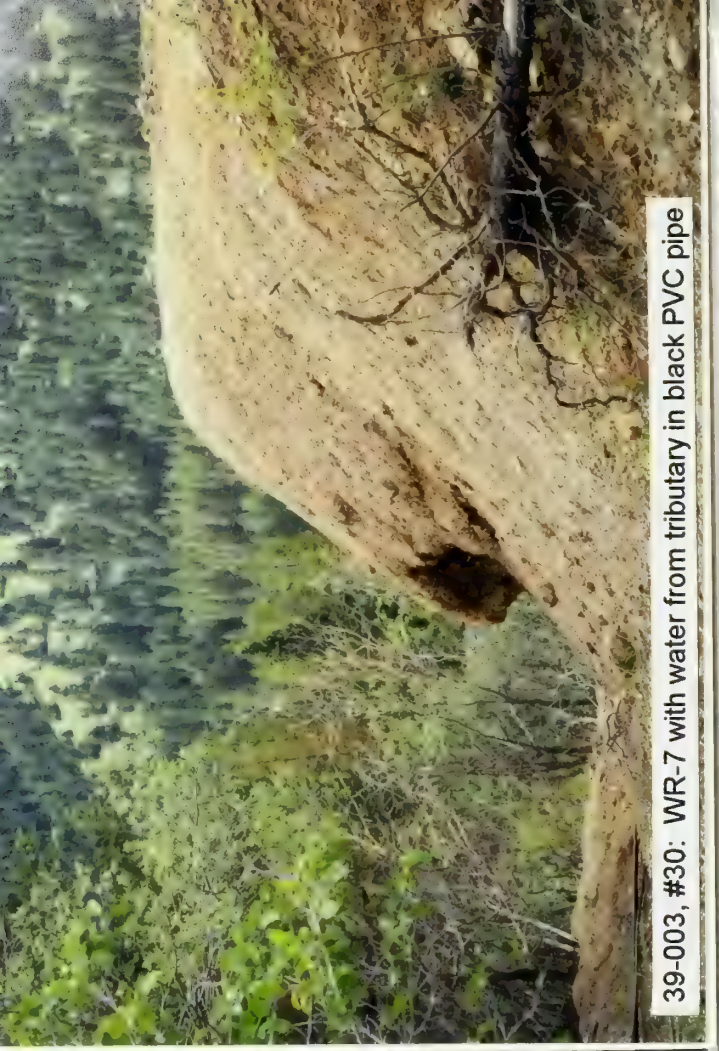


39-003, #28: WR-8 and drainage





39-003, #29: Adit at WR-7 (no discharge)



39-003, #30: WR-7 with water from tributary in black PVC pipe



39-003, #31: Adit at WR-9



39-003, #15: Close up of Adit #1 and discharge; GW-1 sample location

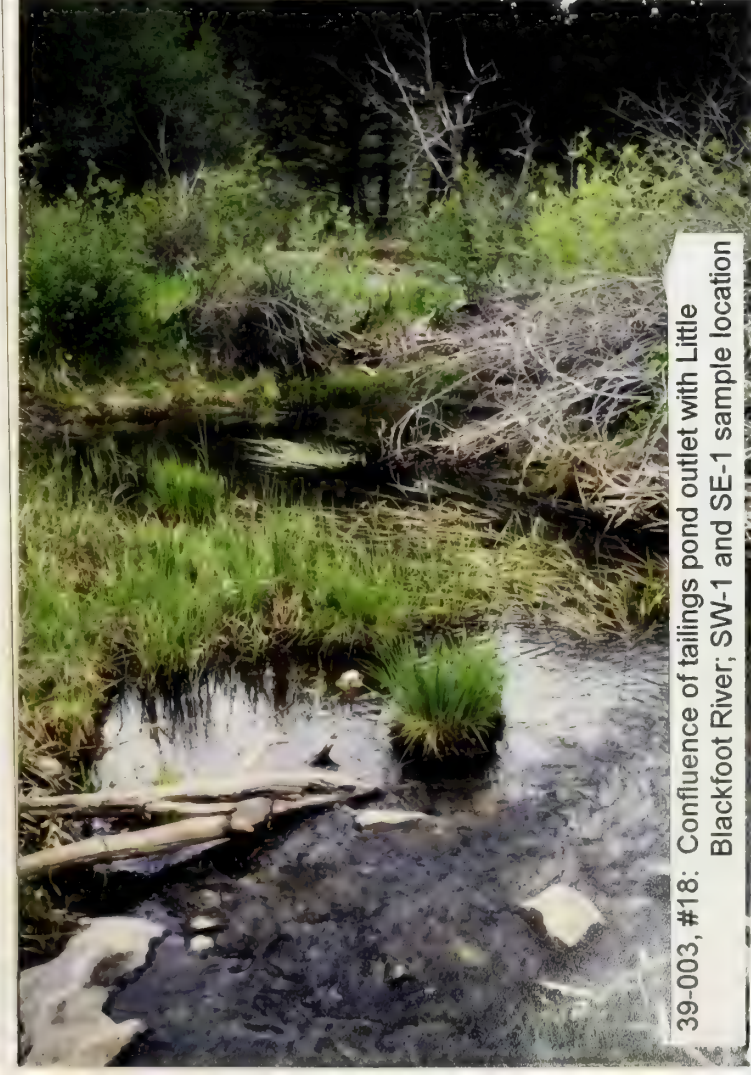




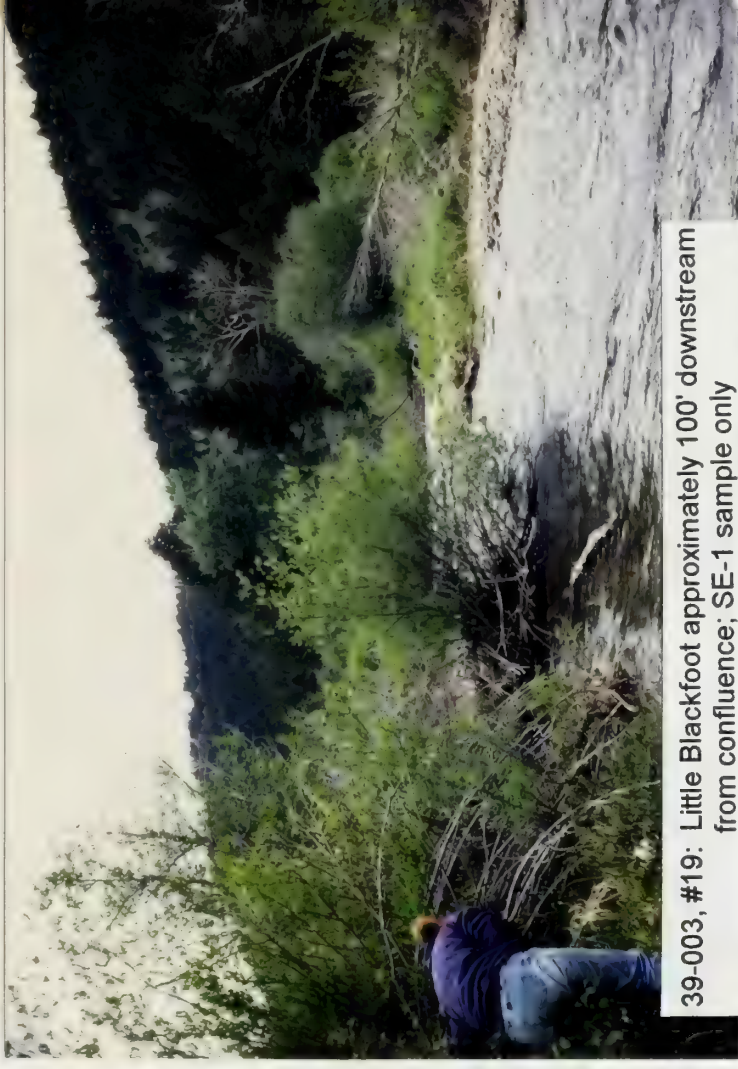
39-003, #16: Adit #1 (HMO) and discharge; GW-1 sample  
sample location



39-003, #17: Adit #2 above mill; GW-2 sample location

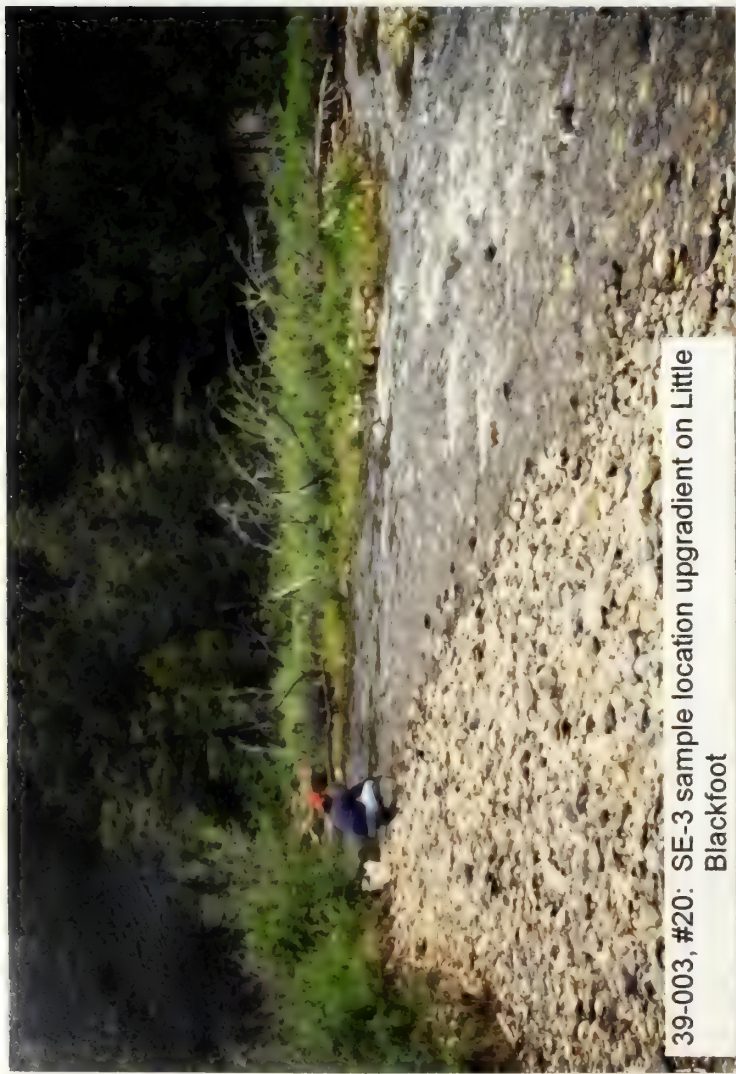


39-003, #18: Confluence of tailings pond outlet with Little  
Blackfoot River; SW-1 and SE-1 sample location



39-003, #19: Little Blackfoot approximately 100' downstream  
from confluence; SE-1 sample only





39-003, #20: SE-3 sample location upgradient on Little  
Blackfoot



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: LILY/ORPHAN BOY PA#: 39-006

Date: June 28, 1993 Time: 1300-1715

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer  
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Thunderstorms, rain; 60°F.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): No photos were taken. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Regrade, lime, and revegetate WR-1. Excavate WR-2 from pond and place on WR-1. Study water treatment requirements and alternatives.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): LILY/ORPHAN BOY PA#: 39-006

Legal Description: T 8N ; R 6W ; Sec. 15 , NE1/4SW 1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 26' 34" Longitude: W 112° 20' 27"

Primary Drainage Basin and Code: Little Blackfoot River/17010201  
Secondary Drainage Basin: Telegraph Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Gold, Lead, Zinc, Silver, Copper

Activity Status: Active ☐ , Inactive/Exploration ☒ , Abandoned ☐ .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Elve Newman,  
Box 159, Elliston, MT 59728-0159. (406) 549-6785; Helena National  
Forest.

Relationship to other mines/sites in the area/district: All  
deposits in Elliston District are similar, both in origin and  
mineralogy.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Shaft has been covered with grate by  
MDSL.

General site features: Elevation 6960' , Slope 5°-22° ,  
Aspect Southwestern

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 1 acres.  
Dimensions:

Predominant vegetation types: Lodgepole pine, manzisi, grouse  
whortleberry

Access: roads - good ☒ , poor ☐ , 4wd ☐ , trail ☐ .  
Other logistical considerations (proximity to other sites). Near  
Annie R./Hattie M. and Sure Thing sites



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Lower half of the site lies directly in the Telegraph Creek drainage which flows north through the site to its confluence with the Little Blackfoot River. The area is underlain by quartz monzonite which is cut by quartz tourmaline veins.

Mining/milling history, ore type/tenor, host rock, gangue: East trending high angle vein with pyrite, arsenopyrite, galena, and sphalerite in quartz and tourmaline gangue; host rock is quartz monzonite locally altered by sericitization and argillization. Production records 1934-1957 inclusive 1,228 tons of ore produced 333 oz of Au, 12,520 oz of Ag, 2,753 lbs of Cu, 85,377 lbs of Pb, and 39,899 lbs of Zn.

Mine Operation?

Shafts - Yes X, No     , # 1, Comment Double compartment-grated  
Adits - Yes X, No     , # 1, Comment Caved in  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

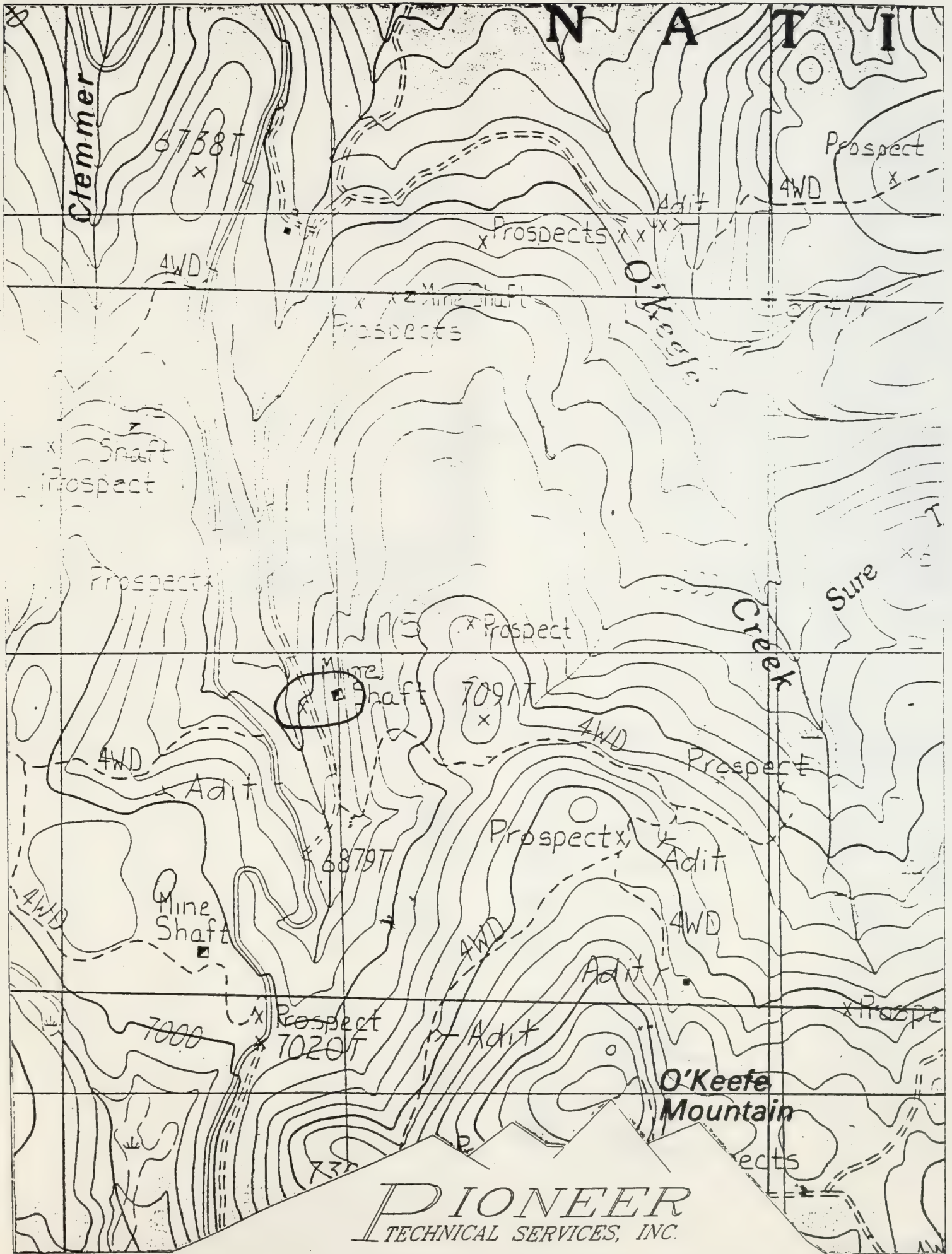


Montana Bureau of Mines and Geology  
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
57348	08N 06W 16 AAC	50.0	15.0	0.00





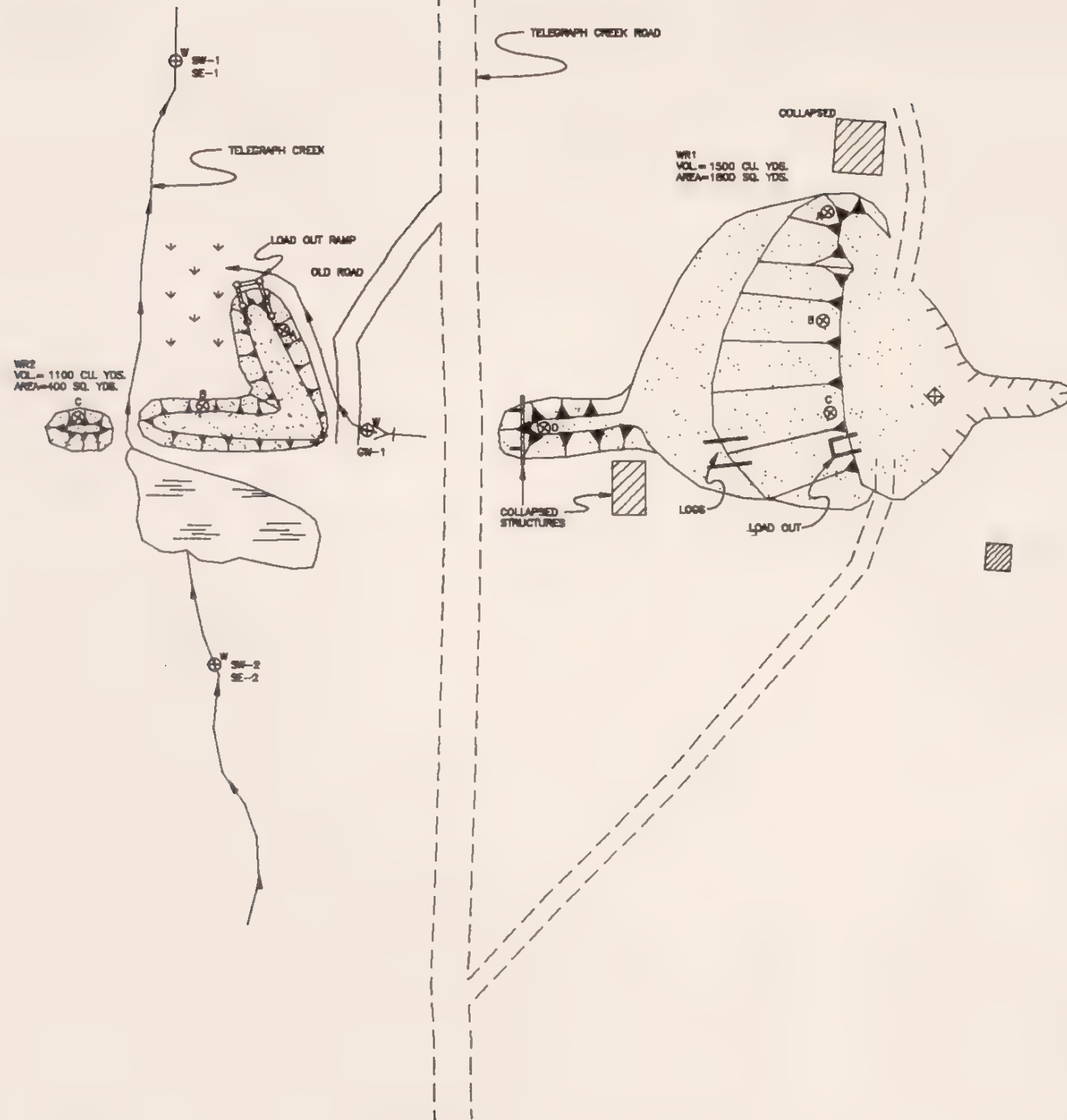
LILY/ORPHAN BOY, P.A. NO. 39-006

T08N, R06W, SECTION 15

SCALE: 1" = 1000'







EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WASTE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARRIER POST		SOIL SAMPLE
	GATE		XRF SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE
	EDGE OF GRAVEL		GROUND AND SURFACE
	SLOPE DIRECTION		DRAINAGE
	TAILINGS POND		WATER WELL
			PONDED WATER
			VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

LILY/ORPHAN BOY PA# 39-006  
ELLISTON DISTRICT POWELL COUNTY

DRAWN JTP DATE 17 NOV 93  
DESIGNED TPR JOB NO. 93-17  
APPROVED WJB F.B. NO.

**PIONEER**  
FEDERAL SERVICE INC. BUTTE, MT.

**TDSH**

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A





**SAMPLERS:** Bullock, Flammang

[illegible]

D-Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 39-006-WR-1 is composite of WR-1A through -1D. 39-006-WR-2 is composite of WR-2A through -2C.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Adit #1

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes     , No X, Number:      Identification:     

Groundwater wells within 4 miles?: Yes X, No     ;

Number of well logs: 24

Distance to nearest well used for drinking? Approx. 3 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable X, Possible     , Unlikely     .

Adit discharge; extensive workings associated with the shaft

Other observations/notes: N/A



**SAMPLERS: Bullock**

[illegible]

W/OUT: Rotational (R) or measured (M) from edit, shaft, sec or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No     , Name(s): Telegraph Creek

Dry streambeds: Yes     , No X , Name(s):    

Other surface water: Yes X , No     , Name(s)/Description: Pond behind WR-2 in Telegraph Creek

Waste materials within any floodplain: Yes X , No     Source ID(s): WR-2 is cut by Telegraph Creek.

Approximate Flood frequency? X 1 yr,     10 yr,     100 yr

Estimated seasonal flow of stream(s) (cfs)?      
High Flow: 10 cfs , Average Flow: 1 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; Telegraph Creek cuts WR-2.

Surface water draining onto or through waste sources: Yes X , No     ,  
Describe: See above

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, wetland, fishery, stock watering

Observed erosional/sedimentation/stream turbidity problems? Yes X ,  
No     , Distance downstream (ft)? >100 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Large sediment plume observed in stream from upgradient source(s) following thunder shower.



**SAMPLERS:** Bullock, Flammang

HOWLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 10+ acres

Wetlands present: Yes X, No     , Describe: Marshy area north of WR-2 and pond above WR-2

Carbonate rocks/soils: Yes     , No X, Describe:                     

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30     ; 30-100     ; 100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ; Comments                     

Nearest residence(ft or miles)? Approx. 3 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS:** Bullock, Flammang

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Beer  
cans, campfire ring

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium____, Low <u>Not Rated</u>
Wetlands Frontage -	High____, Medium____, Low <u>Not Rated</u>
Fisheries Habitat and Species Classification -	<u>1</u>
Sport Fishery Classification -	<u>4</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Shaft with grate

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Cabin near shaft

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 1, types and locations: WR-2 in Telegraph Creek drainage is  
eroding.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



## Bibliography

MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976.

MBMG, Well Log Database, September 8, 1993.

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MDHES/WQB, Analytical Data for Lily/Orphan Boy, June 1, 1977.

MDSL/AMRB, Environmental Assessment Analytical Data for Lily/Orphan Boy, Prepared by MSE, Inc., October 4 and November 7, 1990.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Lily/Orphan Boy, Prepared by Daphne Digrindakis, August 30, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Lily/Orphan Boy, Prepared by Northern Engineering and Testing, June 6, 1988.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

LILY/ORPHAN BOY  
PA NO. 39-006





SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-006-SE-1	4450	283	38.4	118	4.1 U	440	61800	0.106 J	14200	86	550	15 UJ	1200	NR
39-006-SE-2	104	62.8	0.5 U	15.5	3.5	11.5	18300	0.018 U	1570	13	65	4 UJ	164	NR
39-006-WR-1	13000	43.7	5.9	7	1.9	78.3	29900	0.861 J	1310	9	9720	254 J	612	NR
39-006-WR-2	21500	15.1	0.4 U	11.2	1.7	125	71800	0.289 J	43	1 U	9850	164 J	251	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	t/1000t	%	t/1000t	%	t/1000t	%	t/1000t	%	t/1000t	%	t/1000t	%	t/1000t
39-006-WR-1	1.78	55.6	-1.3	-57	0.49	0.56	0.73	17.5	0.56	0.73	17.5	17.5	-18.8	-181
39-006-WR-2	8.55	267	-5.7	-273	0.54	5.61	2.4	175	5.61	2.4	175	175	-181	-181

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
39-006-GW-1	881	14.5	342 J	42.1 JX	5 U	620	19200	0.038 U	5410	32.6	398	36.7	22500	132
39-006-SW-1	20.5	15.7	7.3 J	7.33 JX	7.93	11.7	1900	0.038 U	226	11	4.77	18.3 U	635	16.8
39-006-SW-2	4.3	8.87	2.55 U	5.99 UX	7	1.57	552	0.042	41.5	8.78 U	1.38	18.3 U	23.4	11

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-006-GW-1	470	< 5.0	282	< 0.05	NR
39-006-SW-1	83	< 5.0	16	< 0.05	NR
39-006-SW-2	69	< 5.0	8	< 0.05	NR

LEGEND

- SE1 - Downstream of waste rock dump 2 approx. 200'  
SE2 - Upstream of pond behind waste rock dump 2  
WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
WR2 - Composite of subsamples WR2A, 2B, and 2C.  
BACKGROUND - From the Ontario Millsite (39-010-SS-1).
- GW1 - Collapsed adit #1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**XRF ANALYSIS RESULTS**

**LILY/ORPHAN BOY  
PA NO. 39-006**





\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

LILY/ORPHAN BOY  
PA NO. 39-006





# AIMSS SCORESHEET

SITE NAME:  
PA NUMBER:

LILY/ORPHAN BOY  
39-006

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 71.384
6	GW - TARGETS	WELLS - 1 MI. x 2.5	2.5
7		WELLS - 1 TO 4 MI	23
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 25.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 728117
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	100
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 74.632
16	SW - TARGETS	DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19		FISHERY	20
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 THRU 22 37
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 2209107
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	15
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 75
27		LIKELIHOOD SCORE	LINES 25 + 26C 75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 2.706
29	AIR - TARGETS	POPULATION - 4 MILES	1
30		NEAREST RESIDENCE	0
31		WETLANDS	0
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 THRU 33 1
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 203
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 2.596
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	0
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	5
43		TARGETS SCORE	SUM LINES 40 THRU 42 5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 1947
45		TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE	(LINES 10 + 24 + 35 + 44) / 100,000 29.39

SITE NAME:

LILY/ORPHAN BOY

PA NUMBER:

39-006

**SITE SAFETY**

LINE NO.	THREAT	ACCESSIBILITY		
1				20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	140
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	5
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>14.00</b>

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**



STATE HEALTH DEPT.

WATER QUALITY BUREAU

HELENA, MONTANA 59601

STATE MONTANA

COUNTY POWELL

LAT.-LONG. 46263IN 1121954W

SAMPLE LOCATION BN 6W 15DAC

STATION CODE

ANALYSIS NUMBER 77W1021

DATE SAMPLED 06-01-77

DRAINAGE BASIN 076G -CLARK FK R

TIME SAMPLED 1500

WATER FLOW RATE .40CFS(M)

METHOD SAMPLED GRAB

FLOW MEASUREMENT METHOD GURLEY METER

SAMPLE SOURCE STREAM

ALTITUDE OF LAND SURFACE

WATER USE MULTIPLE

TOTAL WELL DEPTH BELOW LS

AQUIFER(S)

SWL ABOVE(+) OR BELOW LS

SAMPLED BY WQBH

SAMPLE DEPTH BELOW SURFACE

SAMPLING SITE: TELEGRAPH CK JUST ABOVE LILY-ORPHAN MINE

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	11.0	0.229
IRON (FE)			FLUORIDE (F)		
MANGANESE (MN)			PHOSPHATE (PO4 AS P)		
ALUMINUM (AL)			NO3+NO2 (TOT AS N)		

SUM CATIONS

0.0

0.0

SUM ANIONS

11.000

0.229

LABORATORY PH

6.60

TOT HARDNESS (MG/L-CACO3)

FIELD WATER TEMPERATURE (C)

TOT ALKALINITY (MG/L-CACO3)

SUM-DISS. IONS MEAS. (MG/L)

LABORATORY TURBIDITY (JTU)

LAB CONDUCTIVITY-UMHOS-25C

34.0

SODIUM ADSORPTION RATIO

A D D I T I O N A L

P A R A M E T E R S

LEAD, TR (MG/L AS PB)

&lt; 0.05

IRON, TR (MG/L AS FE)

.16

CADMIUM, TR (MG/L AS CD)

&lt; 0.005

COPPER, TR (MG/L AS CU)

&lt; 0.01

ZINC, TR (MG/L AS ZN)

&lt; 0.01

MANGANESE, TR (MG/L AS MN)

.05

ARSENIC, TR (MG/L AS AS)

.003

SILVER, TR (MG/L AS AG)

&lt; 0.01

REMARKS: BOULDER BATHOLITH 0662

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVLENTS PER LITER

ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED

(M)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 06

SAMPLER

DP

HANDLING 3201

ANALYST LAB

LAB WQBH

COMPLETED 08-11-77 COMPUTER RUN 06/29/77 DATA 0975/PROG 0876 FUND 0662

STND DEV. ION BALANCE 2.50

CA

MG

NA

K

CL

SO4

HCO3

CO3

NO3

SEGMENT

MPDES

0.0

0.0

0.0

0.0

0.0100.0

0.0

0.0

0.0

0.0

CALC. MEQ/L= INSUFFICIENT DATA

77W1021



STATE	MONTANA	COUNTY	POWELL
LAT.-LONG.	462631N 1121944W	SAMPLE LOCATION	8N 6W 15DAD
STATION CODE		ANALYSIS NUMBER	77W1019
DATE SAMPLED	06-01-77	DRAINAGE BASIN	
TIME SAMPLED	1400	WATER FLOW RATE	4.0 GPH(M)
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	BUCKET+ TIME
SAMPLE SOURCE	MINE DRAIN	ALTITUDE OF LAND SURFACE	
WATER USE	UNUSED	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: LILY-ORPHAN BOY MINE SEEP

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	365.	7.599
IRON (FE)			FLUORIDE (F)		
MANGANESE (MN)			PHOSPHATE (PO4 AS P)		
ALUMINUM (AL)			NO3+NO2 (TOT AS N)		
HYDROGEN (H+)	1.01	1.000			

SUM CATIONS	1.008	1.000	SUM ANIONS	365.000	7.599
-------------	-------	-------	------------	---------	-------

LABORATORY PH	3.00	TOT HARDNESS (MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY (MG/L-CACO3)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (JTU)	
LAB CONDUCTIVITY-UMHOS-25C	999.0	SODIUM ADSORPTION RATIO	

## A D D I T I O N A L P A R A M E T E R S

LEAD, TR (MG/L AS PB)	.08	IRON, TR (MG/L AS FE)	48.
CADMIUM, TR (MG/L AS CD)	.24	COPPER, TR (MG/L AS CU)	.36
ZINC, TR (MG/L AS ZN)	26.	MANGANESE, TR (MG/L AS MN)	9.8
ARSENIC, TR (MG/L AS AS)	12.	SILVER, TR (MG/L AS AG)	< 0.01
MERCURY, TR (MG/L AS HG)	< 0.0002		

REMARKS: BOULDER BATHOLITH 0662

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER  
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
 (M)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 04	SAMPLER	DP	HANDLING 2100	ANALYST	LAB	LAB
COMPLETED 05-16-77	COMPUTER RUN	09/27/77	DATA	0975/PROG	0876	FUND
STND DEV. ION BALANCE	9.99	CA	MG	NA	K	CL SO4 HCO3 CO3 NO3
SEGMENT	MPDES	0.0	0.0	0.0	0.0	0.0100.0 0.0 0.0 0.0
CALC. MEQ/L=	INSUFFICIENT DATA					77W1019



STATE	MONTANA	COUNTY	POWELL
LAT.-LONG.	462638N 1121954W	SAMPLE LOCATION	8N 6W 15DAB
STATION CODE		ANALYSIS NUMBER	77W1020
DATE SAMPLED	06-01-77	DRAINAGE BASIN	
TIME SAMPLED	1430	WATER FLOW RATE	.47CFS(M)
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	GURLEY METER
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: TELEGRAPH CK JUST BL LILY-ORPHAN MINE

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	16.0	0.333
IRON (FE)			FLUORIDE (F)		
MANGANESE (MN)			PHOSPHATE (PO4 AS P)		
ALUMINUM (AL)			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	16.000	0.333
-------------	-----	-----	------------	--------	-------

LABORATORY PH	6.20	TOT HARDNESS (MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY (MG/L-CACO3)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (JTU)	
LAB CONDUCTIVITY-UMHOS-25C	60.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L		P A R A M E T E R S	
LEAD, TR (MG/L AS PB)	< 0.05	IRON, TR (MG/L AS FE)	.41
CADMIUM, TR (MG/L AS CD)	.005	COPPER, TR (MG/L AS CU)	.01
ZINC, TR (MG/L AS ZN)	.53	MANGANESE, TR (MG/L AS MN)	.30
ARSENIC, TR (MG/L AS AS)	.029	SILVER, TR (MG/L AS AG)	< 0.01
MERCURY, TR (MG/L AS HG)	< 0.0002		

REMARKS: BOULDER BATHOLITH 0662 CREEK RUNS THROUGH MINE TAILINGS

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER  
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
 (M)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 05	SAMPLER DP	HANDLING 3201	ANALYST LAB	LAB
COMPLETED 09-16-77	COMPUTER RUN 09/27/77	DATA 0975/PROG 0876	FUND	
STND DEV. ION BALANCE 3.60	CA	MG	NA	K
SEGMENT MPDES	0.0	0.0	0.0	0.0
CALC. MEQ/L= INSUFFICIENT DATA				

77W1020

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Lilly Orphan Boy Adit

LAB NO: W8576

DATE RECEIVED: 09-14-90

Hardness 154 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.196 mg/L

Cd 0.233 mg/L

Cu 0.16 mg/L

Fe 28.1 mg/L

Pb 0.198 mg/L

Zn 25.5 mg/L

DATE: November 7, 1990

CLIENT: Abandoned Mines

FIELD ID: Lilly Orphan Boy Adit Dump #1

LAB NO: S2760

DATE RECEIVED: 10/09/90

pH (1:1 slurry) 2.20 SU

Total Metals

As 3360 mg/Kg

Cd 2.10 mg/Kg

Cu 113 mg/Kg

Fe 22.000 mg/Kg

Pb 5980 mg/Kg

Zn 552 mg/Kg



DATE: November 7, 1990

CLIENT: Abandoned Mines

FIELD ID: Lilly Orphan Boy Adit Dump #2

LAB NO: S2761

DATE RECEIVED: 10/09/90

pH (1:1 slurry) 2.94 SU

Total Metals

As 118.000 mg/Kg

Cd 2.87 mg/Kg

Cu 118 mg/Kg

Fe 222.000 mg/Kg

Pb 13.000 mg/Kg

Zn 688 mg/Kg



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MONARCH PA#: 39-008

Date: August 18, 1993 Time: 0900-1000

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Belanger

Visitors: None

Weather/Seasonality Observations: Clear; cool and dewy form early morning; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #9: Adit #1, GW-1 sample location; #10: Adit area, facing north; #11: WR-1 area, facing north; #12: New small mill. Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): Hiked approx. 1/4 mile from locked Forest Service gate.

Other Hazardous Materials/Substances Present: Barrels of lube oil are present on the site. An empty fuel tank is also present and may contain sludge.

General Comments on Potential Remedial Alternatives: Grade, amend and revegetate dump. Close HMO if necessary.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MONARCH PA#: 39-008

Legal Description: T 8N ; R 6W ; Sec. 31 , NE1/4NW 1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 24' 27" Longitude: W 112° 24' 12"

Primary Drainage Basin and Code: Little Blackfoot/17010201

Secondary Drainage Basin: Monarch Creek

USGS Quadrangle map name(s): Bison Mountain

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: Active ☐ , Inactive/Exploration ☒ , Abandoned ☐ .

Ownership status: Known YX ☐ N ☐ ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Helena National Forest.

Relationship to other mines/sites in the area/district: The Hard Luck mine is approx. 1.5 miles to the northeast.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Permit status unknown, but the mine is operating intermittently.

General site features: Elevation 6800' , Slope 18° ,  
Aspect Northwest

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 1.5 acres.  
Dimensions:

Predominant vegetation types: Lodgepole pine, spruce, juniper

Access: roads - good ☒ , poor ☐ , 4wd ☐ , trail ☐ .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 4 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). The vein developed by these workings is locally in a fault zone along a contact between quartz monzonite and andesite. The mine site lies on a hill side on the west side of perennial Monarch Creek, which flows north past the site.

Mining/milling history, ore type/tenor, host rock, gangue: Historic milling is possible, but no tailings could be found within a 1 mile radius of the old mill structure. New milling machinery on the site has not been used. The vein contains galena, sphalerite, pyrite, arsenopyrite, chalcopyrite, and tetrahedrite in a quartz gangue.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment Open, flowing  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes X, No     . If yes answer the next three questions:

Period(s) of Operation: Partially assembled new small mill; no production to date.

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
Unknown

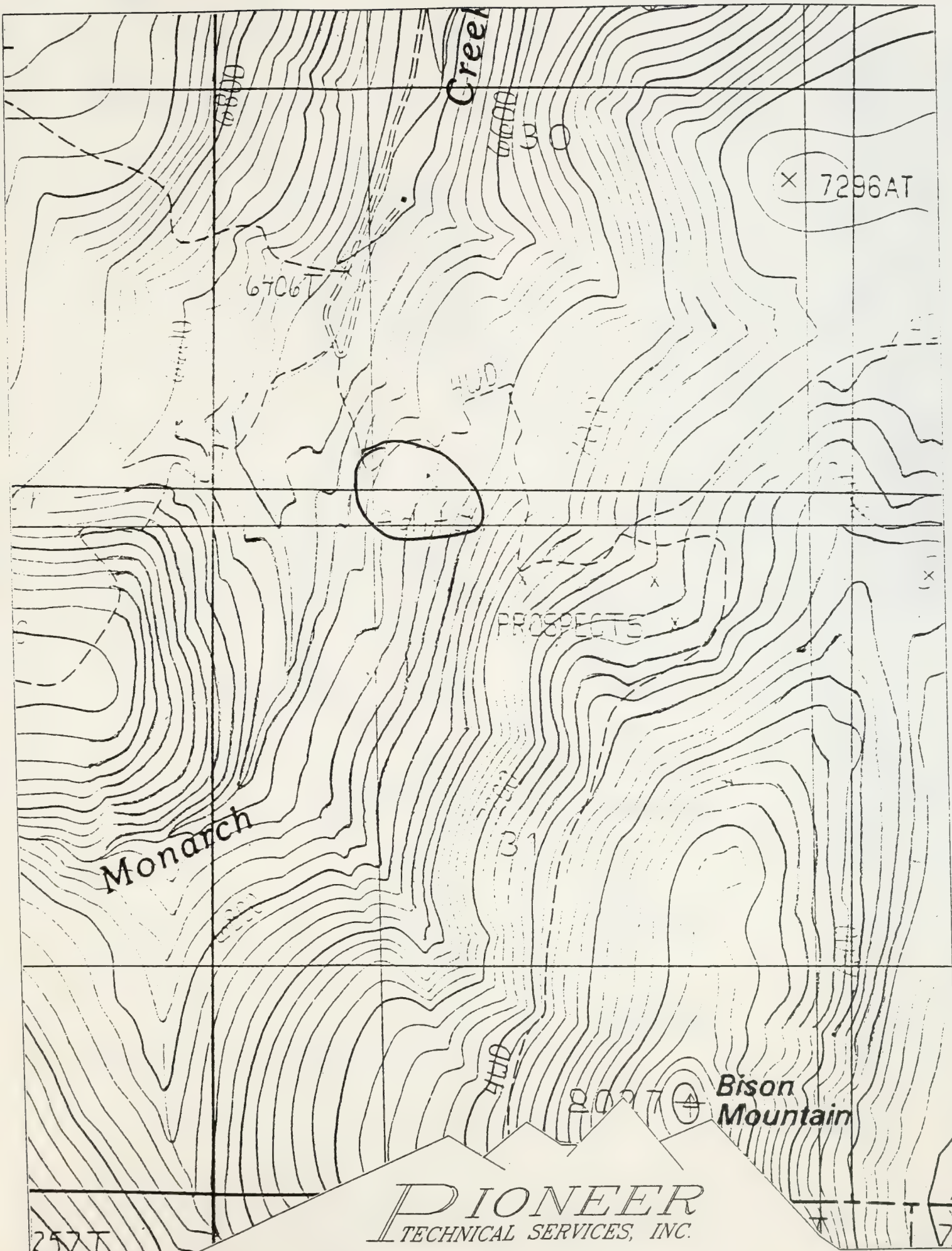
Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:5473	08N 06W 05 AA	0.0	0.0	0.00
M:59206	09N 06W 32 AA	105.0	10.0	18.00
M:59207	09N 06W 32 ACDA	31.0	8.0	3.00
M:57351	08N 07W 01 B	41.0	30.0	4.00







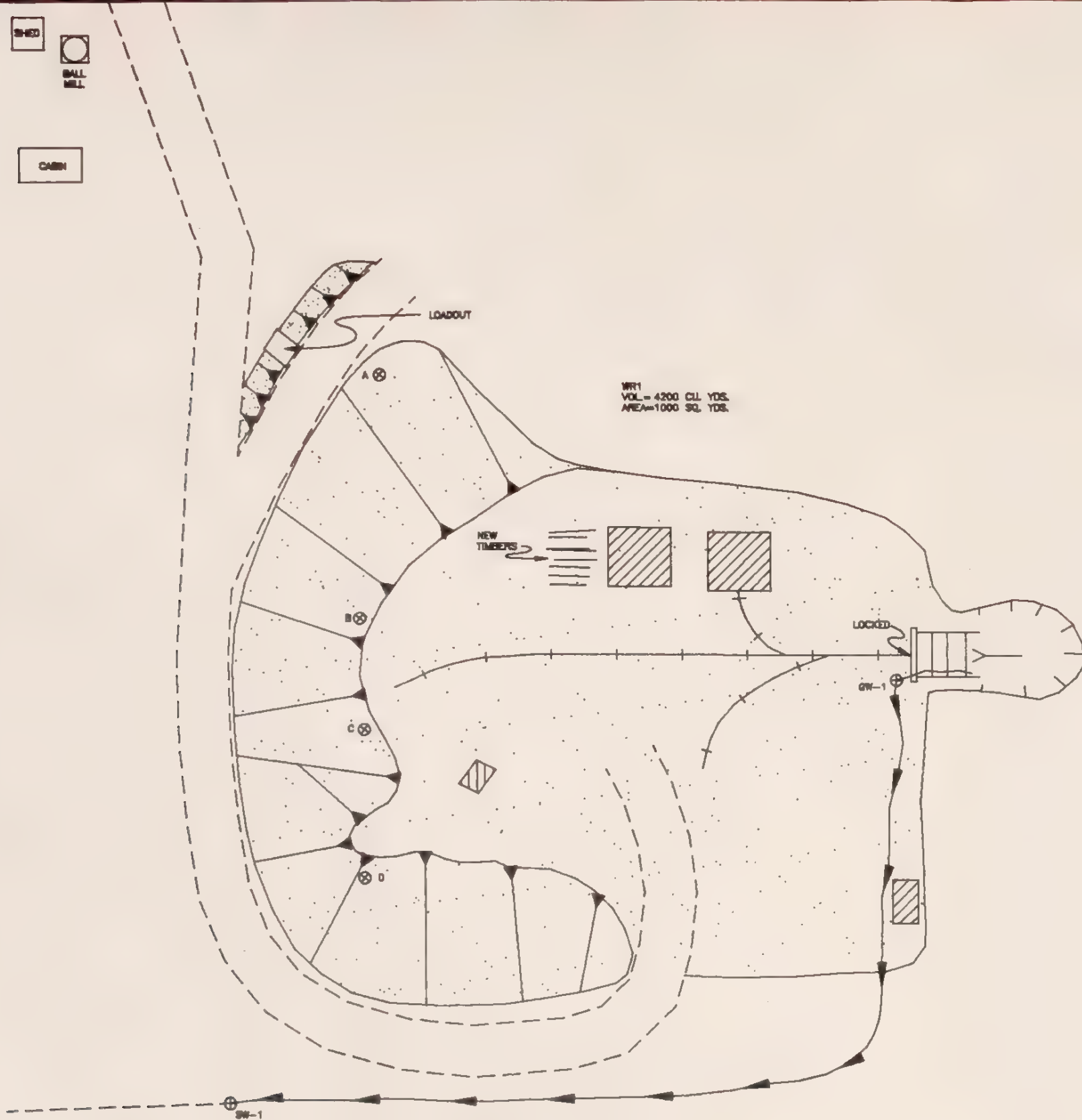
*PIONEER*  
TECHNICAL SERVICES, INC.

MONARCH, P.A. NO. 39-008

T08N, R06W, SECTION 31

SCALE: 1" = 1000'





EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WASTE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARRIER POST		LAB SAMPLE
	GATE		XRF SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE
	EDGE OF GRAVEL		GROUND AND SURFACE DRAINAGE
	SLOPE DIRECTION		WATER WELL
	TAILINGS POND		PONDED WATER
			VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

MONARCH PA# 39-008  
ELLISTON DISTRICT POWELL COUNTY

DRAWN: JTP DATE: 18 NOV 93  
DESIGNED: JPR JOB NO: 93-17  
APPROVED: WJB F.B. NO:

PIONEER  
FEDERAL SERVICE, INC. 407  
GREAT FALLS - BOZEMAN - KALISPELL - SPOKANE

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS - BOZEMAN - KALISPELL - SPOKANE  
MONTANA  
WASHINGTON

TDSH

SHEET NO.





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



**SAMPLERS:** Bullock, Belanger

[illegible]

D-Direct reading (Railway Meter); S-Saturated Paste (Orlon Meter)

Comments or deviations from SOPs: 39-008-WR-1 is composite of WR-1A through -1D.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Adit associated with WR-1; GW-1 sample

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes     , No X, Number:      Identification:     

Groundwater wells within 4 miles?: Yes X, No     ;

Number of well logs: 34

Distance to nearest well used for drinking? 4 miles to USFS campground

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable     , Possible X, Unlikely     .

Flowing adit; WR-1 has some elevated metals concentrations

Other observations/notes: N/A



**SAMPLERS:** Belanger

[illegible]

Flow: Estimated (E) or Measured (M) from add, shaft, sump or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No    , Name(s): Unnamed tributary to Monarch Creek

Dry streambeds: Yes    , No X, Name(s):    

Other surface water: Yes    , No X, Name(s)/Description:    

Waste materials within any floodplain: Yes    , No X Source ID(s):    

Approximate Flood frequency?     1 yr,     10 yr,     100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow:    , Average Flow:    

Distance between waste source(s) and nearest surface water body (ft)?      
Adit discharge flows approx. 30 feet from WR-1.

Surface water draining onto or through waste sources: Yes    , No X,  
Describe: Runoff only

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Wetlands, fishery, stock watering, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes    ,  
No X, Distance downstream (ft)?     Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present):



**SAMPLERS:** Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 3 acres

Wetlands present: Yes     , No X, Describe:                     

Carbonate rocks/soils: Yes     , No X, Describe:                     

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30     ; 30-100     ; 100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ; Comments                     

Nearest residence(ft or miles)? Approx. 100 feet to a part-time mining/recreational cabin

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS:** Belanger

[illegible]

## Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments Part-time mining/recreational cabin

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Forest Service locked gate at turn-off to mine

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Bald Eagle  
Bat Habitat - Yes\_\_\_\_, No X, Comment\_\_\_\_\_

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 3  
Sport Fishery Classification - 3

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Adit #1

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Shed at the adit

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes X, No\_\_\_\_, Explain: Explosives are possibly stored in locked shed.

## Bibliography

- MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Monarch, Prepared by Tierra Buena Contracting, December 27, 1982.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Monarch, Prepared by Northern Engineering and Testing, May 17, 1988.
- USGS, Topographic Map, Bison Mountain, Montana, 7 1/2 minute Quadrangle, 1985.





LABORATORY ANALYTICAL DATA

MONARCH  
PA NO. 39-008



SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis														
FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-008-WR-1	163 J	40 J	3.3	8.49	2.85	727 J	42100 J	1.85 J	4240 J	3.49	469 J	195	109 J	NR
BACKGROUND	22.6 J	141 J	1.4	7.17	8.13	18.9 J	16600 J	0.042 J	835 J	5.56	37 J	6.78 U	90.9 J	NR
Acid/Base Accounting														
FIELD ID	TOTAL SULFUR			SULFUR ACID BASE			PYRITIC SULFUR			SULFUR ACID BASE				
	%	1/1000	POTENT. 1/1000	POTENT. 1/1000	%	%	%	1/1000	1/1000	%	1/1000	1/1000		
39-008-WR-1	1	31.2	6.19	-25.	0.44	0.31	0.25	9.68	-3.5					

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

WATER MATRIX ANALYSES															
Metals in Water Results in ug/L															
FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.	
39-008-GW-1	4.21	19.6	2.57 U	9.7 U	6.83 U	1.67 J	46.7	0.19 J	41.6	12.7 U	2.19 J	30.7 U	38.5 J	115	
Wet Chemistry Results in mg/l															
FIELD ID.	TOTAL DISSOLVED SOLIDS			CHLORIDE			SULFATE			NO3/NO2-N CYANIDE					
39-008-GW-1	167	<	5.0	133	<	0.05	NR								

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, and 1D.  
BACKGROUND - From the Monarch Mine (39-008-SS-1).

GW1 - Discharge from adit associated with waste rock dump 1.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

LEGEND

WR1 - Composite of soil samples WR1A, 1B, 1C, and 1D.  
BACKGROUND - From the Monarch Mine (39-008-SS-1).

GW1 - Discharge from adit associated with waste rock dump 1.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested





**XRF ANALYSIS RESULTS**

**MONARCH  
PA NO. 39-008**



XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-008-SS-1		15252.9	6413.14	2603.86		1228.97	21269.1		41.4459 *	144.939	28.3502 *	208.926
39-008-WR1-A		18910.5	3002.49	611.826		1163.56 *	76958.7		1799.76	215.411	522.227	59.9999
39-008-WR1-B		25674.1	3708.02	1674.85		5015.25	32001.2		67.1294 *	241.481		180.742
39-008-WR1-C		30233.5	3147.67	1016.36		10880	52097.8		704.307	202.361	60.8823 *	134.23
39-008-WR1-D		23177.7	6125.82	1350.76		846.499 *	64648.8		490.709	154.83	182.35 *	213.157
39-008-WR-1-COMP		22798	3753.74	1109.96		3454.49	55385.8	366.198 *	634.63	182.829	161.211 *	164.914
39-008-SS-1	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-008-WR1-A	217.166				136.591			500.056			29.0937	
39-008-WR1-B	96.7823		7.4848 *	1014.02	175.527		1779.31	152.422	240.801 *		50.4512	
39-008-WR1-C	223.582		76.2999	584.978	213.375			544.622		19.4675 *	16.1158 *	
39-008-WR1-D	141.681			47.5051 *	235.506			219.28	133.423 *		12.9131 *	
39-008-WR-1-COMP	165.835			442.547	192.801		598.917	454.987	174.383 *		22.0668 *	
	154.656			440.077	184.136		416.7	299.044	119.24 *		24.9492	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

MONARCH  
PA NO. 39-008



# AIMSS SCORESHEET

SITE NAME:

MONARCH

PA NUMBER:

39-008

LINE NO.				
<b><u>GROUNDWATER PATHWAY</u></b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.493
6	GW - TARGETS	WELLS - 1 MI. x 2.5		10.0
7		WELLS - 1 TO 4 MI		30
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	40.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>39888</b>
<b><u>SURFACE WATER PATHWAY</u></b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.727
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	27
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>29452</b>
<b><u>AIR PATHWAY</u></b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	200
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.008
29	AIR - TARGETS	POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		10
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	26
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>42</b>
<b><u>DIRECT CONTACT PATHWAY</u></b>				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	200
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.008
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	11
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>18</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b> (LINES 10 + 24 + 35 + 44) / 100,000			<b>0.69</b>

LINE NO.				SITE NAME:	MONARCH
				PA NUMBER:	39-008
		<b><u>SITE SAFETY</u></b>			
1	THREAT	ACCESSIBILITY			10
2		OPEN SHAFTS	100 EA.		0
3		OPEN ADITS	50 EA.		50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		75
5		HAZ. STRUCTURES	40 EA.		0
6		EXPLOSIVES			50
7		HAZ. MATERIALS			100
8		HAZARDS SCORE	SUM LINES 2 THRU 7		275
9		POPULATION - 1 MILE			1
10	TARGETS	NEAREST RESIDENCE			10
11		RECREATIONAL USE			0
12		TARGETS SCORE	SUM LINES 9 THRU 11		11
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>		<b>30.25</b>





39-008, #9: Adit #1; GW-1 sample location



39-008, #10: Adit area, facing north



39-008, #11: WR-1



39-008, #12: New small mill





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ONTARIO MILLSITE PA#: 39-010

Date: June 10 and 11, 1993 Time: 0900-1700

Field Team Leader: Babits/Bullock, Pioneer

Sampling Personnel: Flammang, Lasher, Clark;  
Pioneer  
Pierson; TD&H

Visitors: None

Weather/Seasonality Observations: Partly cloudy; breezy (5-10  
mph); cool (50°F); scattered showers.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #5: SW-2 on un-  
named tributary; #6: TP-4A; #7: TP-4A, -B, and -C; #8: Drainage  
bottom between TP-3 and -4; #9: TP-2; #10: TP-1; #11: 500 feet  
downgradient of TP-4, looking downgradient; #12: 925 feet down-  
gradient of TP-4, looking at confluence of unnamed tributary and  
Ontario Creek; #13: Adit #1 and discharge; #14: Waste rock above  
mill; #15: Mill building; #21: 350 feet downstream of confluence  
of unnamed tributary and Ontario Creek. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: There is a  
potential for reprocessing tailings.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ONTARIO MILLSITE PA#: 39-010

Legal Description: T 8N ; R 6W ; Sec. 22 , NE1/4SW 1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 25' 45" Longitude: W 112° 15' 00"

Primary Drainage Basin and Code: Little Blackfoot River/17010201  
Secondary Drainage Basin: Ontario Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Lead, Zinc, Copper, Silver, Gold

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known ☒ N ☐ ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Bob Newman,  
Montana Gold Ventures, Inc., 2803 Duncan Drive, Missoula, MT  
59802. (406) 549-6785; Helena National Forest.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? No permit known; some heavy equip-  
ment work appears to have been performed because TP-1 has been  
moved around.

General site features: Elevation 6800'-7000' , Slope Approx. 15° ,  
Aspect South

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 8.5 acres.  
Dimensions: Site dimensions are: upper area, approx. 1 acre;  
middle area, approx. 650 feet x 200 feet; lower streamside area,  
2,700 feet x 70 feet.

Predominant vegetation types: Grasses, pines

Access: roads - good ☒ , poor ☐ , 4wd ☐ , trail ☐ .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Mine and mill lie in headwaters of an unnamed tributary to Ontario Creek. Water flows south through the site to confluence with Ontario Creek, which then flows west. Tailings lie along banks and in stream below the mill for the entire length of the unnamed tributary and also in Ontario Creek with a major deposit at the confluence.

Mining/milling history, ore type/tenor, host rock, gangue: Began in 1860, operated mostly from 1890 to 1908. County rock is granite with vein mineralization containing sphalerite, galena, and pyrite in a gangue of quartz.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 2, Comment Caved  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes X, No     . If yes answer the next three questions:

Period(s) of Operation: Late 1800's

Origin of Ore Milled - Custom Mill      Dedicated Mill X; Number and names of mines that supplied mill feed: Ontario mine

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? Most likely floatation; a 150-ton concentrator is mentioned in literature.

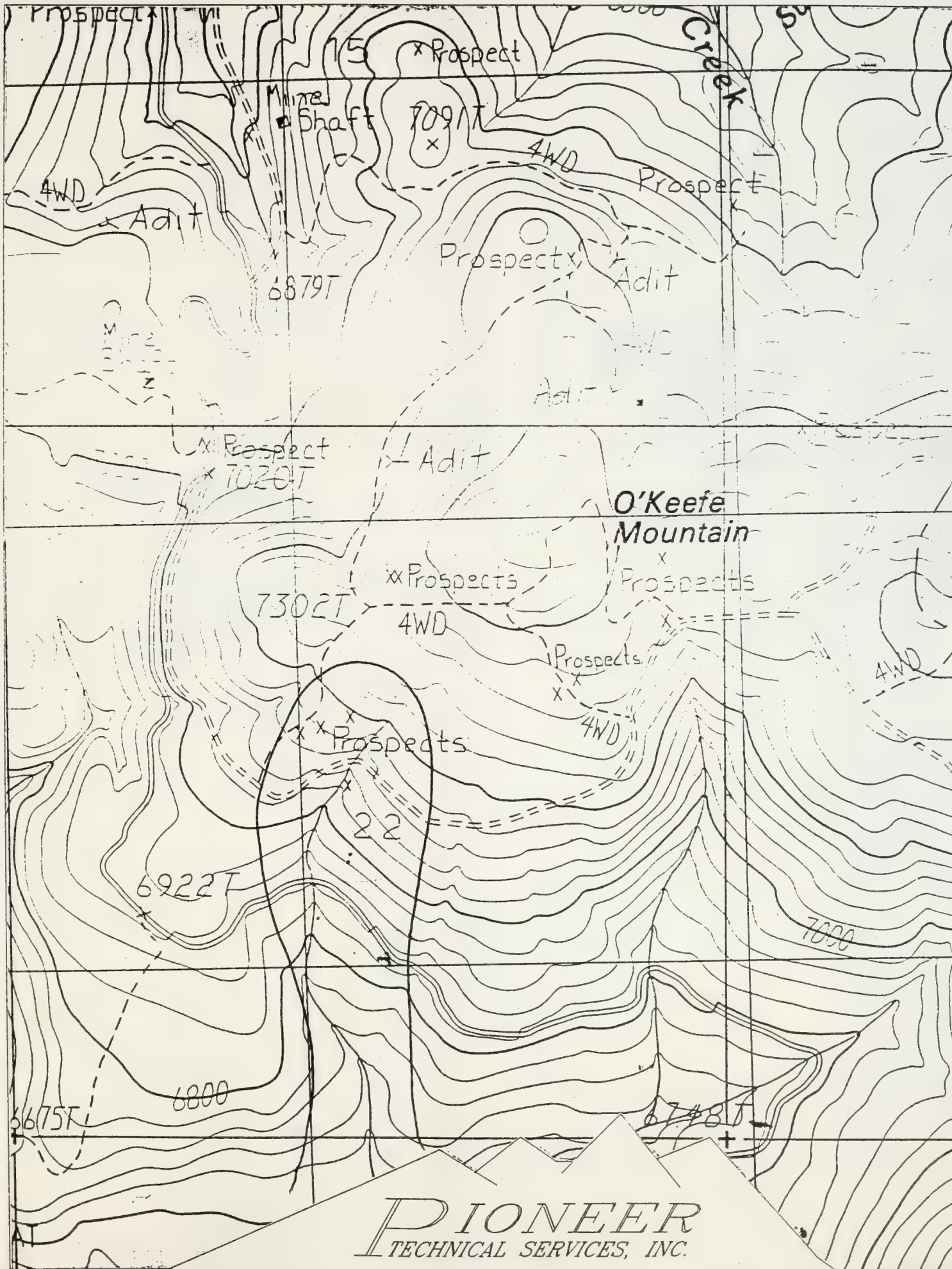
Montana Bureau of Mines and Geology  
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
57348	08N 06W 16 AAC	50.0	15.0	0.00







ONTARIO MILLSITE, P.A. NO. 39-010

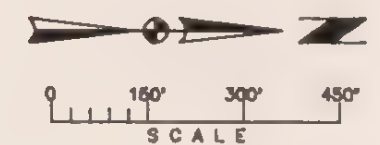
T08N, R06W, SECTION 22

SCALE: 1" = 1000'





SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
○	UTILITY POLE	⊗	OPEN SHAFT
●	DECIDUOUS TREE	⊗	COLLAPSED SHAFT
✱	CONIFEROUS TREE	⬭	EXCAVATION
—	WOOD FENCE	⬭	WASTE ROCK CLAMP
—	WIRE FENCE	⬭	COLLAPSED TIMBERS
▨	BUILDING	—	RAILS
○	BARRIER POST	⊙	SOIL SAMPLE
∧	GATE	⊕	XRF SAMPLE
---	EDGE OF ASPHALT	⊕	WATER SAMPLE GROUND AND SURFACE
---	EDGE OF GRUVEL	→	DRAINAGE
▲	SLOPE DIRECTION	●	WATER WELL
⬭	TAILINGS POND	⬭	PONDED WATER
		↓	VEGETATED WET LANDS



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

ONTARIO MILLSITE PA# 39-010  
ELLISTON DISTRICT POWELL COUNTY

PIONEER  
ENGINEERING CONSULTANTS  
THOMAS, DEAN & HOSKINS INC.  
GREAT FALLS-BOZEMAN-KALISPELL  
SPOKANE

DATE 18 NOV 93  
JOB NO. 93-17  
F.B. NO.

DRAWN JTP  
DESIGNED TPR  
APPROVED MJB

SHEET NO.





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
Predominant texture is coarse sand.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
Depth in TP-1 through -4 ranges from 2'8" to 5'0". All have a similar stratification; tan coarse sand followed by an orange coarse sand (sometimes), followed by a gray coarse sand (reduced) followed by soil.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
All are moist; saturated approx. 1 foot bgs.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
Impoundments are almost nonexistent (rotten logs); some fabric noted in the reworked TP-1 and -2.

Comments on potential for mitigation: \_\_\_\_\_  
Wetlands available or reprocess





# SOURCE INVENTORY FORM

SAMPLERS: Babits, Flammang, Lasher, Clark, Pierson

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
TP-1A	TP	240	Adjacent to and south of road	None	4.0 (D)	0.02	39-010-TP-2	06/10/93 2250	T-Metals, ABA
TP-1B	TP		Adjacent to and south of road	None	6.0 (D)	0.04	39-010-TP-1C	06/10/93 2130	T-Metals, ABA
TP-2A-A	TP	3,600	Approx. 275 feet south of road; 0'-1'	None	5.0 (D)	0.03			
TP-2A-B	TP		Approx. 275 feet south of road; 1'-4'	None	5.0 (D)	0.04			
TP-2A-C	TP		Approx. 275 feet south of road; 4'-4.5'	None	6.0 (D)	0.02			
TP-2B	TP		Approx. 275 feet south of road; only 18" thick	None	N/A	N/A	N/A	N/A	XRF Analysis
TP-2C	TP		Approx. 275 feet south of road; only 6" thick	None	N/A	N/A	N/A	N/A	XRF Analysis
TP-3	TP	130	Approx. 573 feet south of road	None	N/A	N/A	N/A	N/A	XRF Analysis
TP-4A-A	TP	900	Impoundment furthest south; 0"-12"	None	6.2 (D)	0.04			
TP-4A-B	TP		Impoundment furthest south; 12"-18"	None	6.8 (D)	0.02			
TP-4A-C	TP		Impoundment furthest south; 18"-48"	None	6.2 (D)	0.03			
TP-4A-D	TP		Impoundment furthest south; 48"	None	6.4 (D)	0.04			
TP-5A	TP	480	Confluence of unnamed tributary with Ontario Creek	None	6.8 (D)	0.04	39-010-TP-5	06/10/93 2230	T-Metals, ABA
WR-1A	WR	25,000	Waste rock north of mill building	None	6.2 (D)	0.04	N/A	N/A	XRF Analysis
WR-1B	WR		Waste rock north of mill building	None	6.6 (D)	0.05	N/A	N/A	XRF Analysis
WR-1C	WR		Waste rock north of mill building	None	4.8 (D)	0.04	N/A	N/A	XRF Analysis
WR-2	WR	750	Waste rock north of TP-1, off of nose	None	< 3.5 (D)	0.05	N/A	N/A	XRF Analysis
SS-1	BKGRND	N/A	Background soil above WR-1	N/A	N/A	N/A	39-010-SS-1	06/10/93 1345	T-Metals

\*D Direct reading (dry meter); \*Saturated (saturation meter)

Comments or deviations from SOPs: 39-010-TP-1C is composite of TP-1B, TP-2A-C, and TP-4A-D. 39-010-TP-2 is composite of TP-1A, TP-2A-A and -2A-B, and TP-4A-A through -4A-C. No samples taken of TP-2B and -2C because -2B was soil only 18" thick with 1" tailings and -2C was molted (tan and orange) tailings. No sample collected of TP-3 because it was similar to TP-4. Additional volume of tailings present between TP-4 and -5. Tailings are present for 35 feet on either side of unnamed tributary between the two for varying depths.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 2 Identification: Adit #1 and Adit #2

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes     , No X, Number:      Identification:     

Groundwater wells within 4 miles?: Yes X, No     ;

Number of well logs: 15

Distance to nearest well used for drinking? 1.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable X, Possible     , Unlikely     .

Uncontained sources; Adit #1 discharge pH of 2.30 and Adit #2 discharge pH of 3.60.

Other observations/notes: N/A



**SSAMPLERS:** Bullock, Flammang, Clark

[illegible]

FROM: Retained (R) or Measured (M) from edit, shaft, nose or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Unnamed tributary to Ontario Creek

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes X, No     , Name(s)/Description: Ontario Creek; approx. 1000 feet below (downgradient) of TP-4

Waste materials within any floodplain: Yes X, No      Source ID(s): TP-1, -2, -3, -4, and -5

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? Unnamed tributary (0.25 cfs); Ontario Creek (unknown)

High Flow: 1 cfs, Average Flow: 0.2 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet between tailings and unnamed tributary; 0 feet between tailings and Ontario Creek.

Surface water draining onto or through waste sources: Yes X, No     , Describe: Unnamed tributary and Ontario Creek

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Irrigation, stock watering, fishery, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)?      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Runoff flows over tailings piles and sediment was observed running off; 1,600 feet in unnamed tributary and 1,000 feet in Ontario Creek.



# SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Flammang, Clark

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	PH SU	SC $\mu\text{S/cm}$ @ 25°C	Kh mV	Temp °C	ALK. mg/L as $\text{CaCO}_3$	Flow cfs/gpm (M)	LAB. SAMPLE NO.	DATE/TIME	ANALYSERS
SW-1	SW	Downgradient of TP-5 and majority of streambank tailings on Ontario Creek	5.8	35.3	70	8.2	8	3.75 cfs (M)	39-010-SW-1	06/11/93 1615	T-Metals, TDS, Hardness, $\text{SO}_4$ , Cl, $\text{NO}_2/\text{NO}_3$
SE-1	SE	Downgradient of TP-5 and majority of streambank tailings on Ontario Creek	N/A	N/A	N/A	N/A	N/A	N/A	39-010-SE-1	06/11/93 1615	T-Metals
SW-2	SW	Downgradient of furthest downgradient tailings impoundment (TP-4)	3.9	280	NM	10.9	0	0.25 cfs (M)	39-010-SW-2	06/09/93 1000	T-Metals, TDS, Hardness, $\text{SO}_4$ , Cl, $\text{NO}_2/\text{NO}_3$
SE-2	SE	Downgradient of furthest downgradient tailings impoundment (TP-4)	N/A	N/A	N/A	N/A	N/A	N/A	39-010-SE-2	06/09/93 1000	T-Metals
SD-3	SE	500' downgradient from TP-4	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SW-4	SW	Upstream of confluence with tailings in Ontario Creek	6.96	29	5	7.7	11	1.6 cfs (M)	39-010-SW-4	06/11/93 1450	T-Metals, TDS, Hardness, $\text{SO}_4$ , Cl, $\text{NO}_2/\text{NO}_3$
SE-4	SE	Upstream of confluence with tailings in Ontario Creek	N/A	N/A	N/A	N/A	N/A	N/A	39-010-SE-4	06/11/93 1450	T-Metals
SD-4	SE	Just before confluence with Ontario 1000' downgradient from TP-4	6.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 15 acres

Wetlands present: Yes X, No    , Describe: Streamside

Carbonate rocks/soils: Yes    , No X, Describe:                     

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10    ; 10-30 X; 30-100    ; 100-300    ; 300-1,000    ; 1,000-3,000    ; 3,000-10,000    ; 10,000 or greater    ; Comments                                     

Nearest residence(ft or miles)? 1.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Flammang, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/NO TERRATE/LOW/MONE)
TP-1	None	Wet	2,160	2,160	Yes	Moderate/Low
TP-2	None	Wet	24,300	24,300	Yes	Moderate/Low
TP-3	None	Wet	1,800	1,440	Yes	Moderate/Low
TP-4	None	Wet	6,120	4,896	Yes	Moderate/Low
TP-5	None	Wet	3,420	3,420	Yes	Moderate/Low
WR-1	None	Partial	45,000	45,000	Yes	Low
WR-2	None	Partial	2,700	2,000	No	None

Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>3</u>
Sport Fishery Classification -	<u>3</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Fire and/or Explosion hazards: Yes X, No\_\_\_\_, Explain: Collapsed mill building

## Bibliography

- MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDHES/WQB, Analytical Data for Ontario, June 1, 1977.
- MDSL/AMRB, Environmental Assessment Analytical Data, Prepared by MSE, Inc., October 4 and 29, 1990.
- MDSL/AMRB Files, Abandoned Mine Lands National Inventory for Ontario Millsite, Prepared by Daphne Diggrindakis, August 30, 1982.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Ontario Millsite, Prepared by Northern Engineering and Testing, June 8, 1988.
- USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.







LABORATORY ANALYTICAL DATA

ONTARIO MILLSITE  
PA NO. 39-010



Ontario Millsite PA# 39-010  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/10/93

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils			Results per dry weight basis										CYANIDE			
	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)			
39-010-SE-1	851	26.7	1.8 J	8.5	2.9	60.7	8060	0.034 JX	544 J	4	337	18 J	150 J	NR			
39-010-SE-2	3420	17.4	0.5 U	1.3 U	2.5	52.1	25000	0.114 JX	19.9 J	2	2080	128 J	273 J	NR			
39-010-SE-4	12	26.7	0.6 U	8	1.8	9.3	8410	0.031 JX	269 J	3	12	4 UJ	62 J	NR			
39-010-TP-1	1790	41.1	30.7 J	4	4	628	7560	0.085 JX	74.4 J	9	1410	61 J	2530 J	NR			
39-010-TP-2	2730	8.5	13.8 J	1.2	1 U	178	6930	0.113 JX	22.2 J	2 U	1290	130 J	1770 J	NR			
39-010-TP-5	1510	5.8	0.4 U	1 U	0.9	47.4	3550	0.093 JX	4.3 J	2 U	2090	55 J	76 J	NR			
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR			

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL				SULFUR				PYRITIC				SULFUR			
	SULFUR	ACID BASE	POTENT.	%	SULFUR	ACID BASE	POTENT.	%	SULFUR	ACID BASE	POTENT.	%	SULFUR	ACID BASE	POTENT.	%
39-010-TP-1	1.35	42.2	-6.1	<0.01	-48.	-18	-3.0	0.09	4.06	1.22	0.03	0.09	4.06	1.22	0.03	0.09
39-010-TP-2	0.52	16.2	-1.7	0.12	-18	-3.0	0.07	0.05	1.56	0.35	0.03	0.09	1.56	0.35	0.03	0.09
39-010-TP-5	0.1	3.12	0.09	0.07	-3.0	0.07	0.05	<0.01	0	0.03	0.03	0.09	0	0.03	0.03	0.09

WATER MATRIX ANALYSES

FIELD ID	Metals in Water					Results in ug/L					HARDNESS									
	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CALC.						
														(mg CaCO3/L)						
39-010-GW-1	1190	9.27	35	33	5 U	306	44300	0.053 J	2100	21.3	425 J	29.5	5310	82.1						
39-010-GW-2	20.3	14.6	3.9	15.2	6	12.4	6420	0.11 J	1170	8.78 U	2.79 J	18.3 U	768	58.5						
39-010-SW-1	5.4	6.27	2.55 U	5.99 U	5 U	5.67	177	0.093 J	44.4	8.78 U	5.5 J	18.3 U	75	8						
39-010-SW-2	11.3	14	8.6	14.6	5 U	92	480	0.099 J	1160	8.78 U	153 J	18.3 U	1690	47						
39-010-SW-4	2.87	6.73	2.55 U	5.99 U	5 U	1.35 U	198	0.1 J	8.1	8.78 U	2.7 J	18.3 U	7.4	7						
U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested																				

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

LEGEND

- SE1 - Downgradient of TPS & majority of streambank tailings on Ontario Creek.  
GW1 - Adit furthest North, by waste rock dump 1.  
GW2 - Adit furthest South, by waste rock dump 2.  
SE2 - Downgradient of furthest downgradient tailings impoundment (TP4), SW1 - Same as sample SE1.  
SE4 - Upstream of confluence with tailings in Ontario Creek.  
TP1 - Composite of subsamples TP 1B, 2AC, and 4AD.  
TP2 - Composite of subsamples TP1A, 2AA, 2AB, and 4AA through 4AC.  
TP5 - Grab of subsample TP5A.  
BACKGROUND - From the Ontario Millsite (39-010-SS-1).

Wet Chemistry

FIELD ID	Results in mg/l									
	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE					
39-010-GW-1	48	< 5.0	220	< 0.05	NR					
39-010-GW-2	204	< 5.0	92	0.05	NR					
39-010-SW-1	302	< 5.0	10	< 0.05	NR					
39-010-SW-2	186	< 5.0	83	< 0.05	NR					
39-010-SW-4	46	< 5.0	8	< 0.05	NR					





**XRF ANALYSIS RESULTS**

**ONTARIO MILLSITE  
PA NO. 39-010**



## XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-010-SE-3		4746.01	1421.59	276.269 *			82014.8			74.8081 *	5360.18	58.7809
39-010-SE-4		10647.2	3009.24	1350.52			37705.2			83.4562 *	1804.64	151.004
39-010-SS-1		23916.3	6849.75	2764.49		1078.87 *	24881			179.08 *	67.9427 *	259.641
39-010-TP1-A		17234.2	1655.97	544.568			21394.4			91.4224 *	9083.33	24.8129 *
39-010-TP1-B		2755.74	1809.38	495.221	155.325 *		4050.88		109.08 *	1740.32	497.75	48.3481
39-010-TP2A-A		17638.7	1247.52	389.413			6577.93			166.616 *	2246.29	11.3447 *
39-010-TP2A-B		25749.2	1905.44	662.513			10301.4		588.47	2071.06	2876.78	22.3087 *
39-010-TP2A-C		4041.15	1799.19	336.18	149.938 *		3127.9		234.893 *	1736.56	1371.89	56.281
39-010-TP4A-A		20229.7	1528.38	478.431		427.579 *	6503.24			58.317 *	1948.3	31.4478
39-010-TP4A-B		17769.8	1840.73	521.621			10566.5			87.3118 *	4002.21	47.897
39-010-TP4A-C		15596.3	1407.48	507.77	116.667 *		8186.4			431.02	1522.46	23.2635 *
39-010-TP4A-D		5417.2	2783.95	696.736			20454.8			2825.17	397.837	48.6429
39-010-TP5-A		20538.5	1363.46	659.667		351.691 *	7422.41			131.922 *	1339.82	28.0839
39-010-TP-1-COMP		6018.11	3193.97	914.676			10563.1		433.043	2251.59	1490.21	105.097
39-010-TP-2-COMP		18671.7	1737.6	500.911			10855.2		95.5775 *	355.285	3493.9	35.3476
39-010-WR1-A		14124	8589.79	2741.68			52257			103.674 *	904.57	587.974
39-010-WR1-B		37888.5	2345.09	1416.95			22137.5			77.9414 *	172.157 *	81.0454
39-010-WR1-C		29174.5	2735.91	1617.36			20247.4			110.509 *		145.451
39-010-WR-2		18085.8	7434.25	3374.51			41512.4			107.101 *		332.779
Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th		
39-010-SE-3	91.3476		1113.49	80.9973		102.137 *	147.8					
39-010-SE-4	128.596		502.105	122.233		52.7152 *	459.196	71.3001 *		12.2532 *		
39-010-SS-1	230.416		71.5341 *	176.069			791.992			18.8776 *		
39-010-TP1-A	93.4887	6.02363 *	2390.82	158.881		310.833	243.547	100.556 *		39.8021 *		
39-010-TP1-B	45.8631		89.6139	31.3651 *			44.2158					
39-010-TP2A-A	74.4761		994.92	117.653		177.419	158.477	54.3191 *		27.7631 *		
39-010-TP2A-B	97.1315		1235.6	155.397		209.99	241.358	115.409 *		43.8454 *		
39-010-TP2A-C	47.9272		890.676	39.8187 *		44.3727 *	152.136					
39-010-TP4A-A	96.628		1972.31	154.356		177.479	245.466	105.3 *		34.5988 *		
39-010-TP4A-B	109.585		2669.74	135.623		179.903	273.616	80.8137 *		18.6621 *		
39-010-TP4A-C	95.9375		642.199	123.102		136.291	216.013	75.3416 *		29.2344 *		
39-010-TP4A-D	84.8783		287.343	80.7962		41.34 *	117.081			9.94566 *		
39-010-TP5-A	128.678		2102.42	157.56		89.6885 *	199.496	65.6128 *		23.4893 *		
39-010-TP-1-COMP	91.8617		1046.92	68.6837		67.1799 *	164.764	56.6339 *		18.4585 *		
39-010-TP-2-COMP	93.5212		1760.96	148.88		200.088	237.944	94.2611 *		35.3476 *		
39-010-WR1-A	153.035	10.7572 *	393.022	81.3566			466.963			11.9562 *		
39-010-WR1-B	182.285		1395.76	221.62	100.05 *		453.93	68.3622 *		29.2761 *		
39-010-WR1-C	141.247	6.30362 *	876.072	195.702			530.853			14.7982 *		
39-010-WR-2	237.076			125.193			700.519		13.8771 *	24.8799 *		

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

ONTARIO MILLSITE  
PA NO. 39-010



# AIMSS SCORESHEET

SITE NAME:

ONTARIO MILLSITE

PA NUMBER:

39-010

LINE  
NO.

## GROUNDWATER PATHWAY

1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	14
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9

382147

## SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE	300
12		EXCEEDENCES	100
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	3
18	SW - TARGETS	WETLANDS	10
19		FISHERY	5
20		RECREATION	0
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 THRU 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23

979776

## AIR PATHWAY

25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE	0
26A		CONTAINMENT	15
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	10
30	AIR - TARGETS	NEAREST RESIDENCE	0
31		WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 THRU 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34

677

## DIRECT CONTACT PATHWAY

36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE	0
37A		ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	0
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 THRU 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43

0

45 TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE

(LINES 10 + 24 + 35 + 44) / 100,000

13.63

SITE NAME: ONTARIO MILLSITE  
PA NUMBER: 39-010

LINE  
NO.

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	0
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>0.00</b>



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

STATE MONTANA COUNTY POWELL

LAT.-LONG.	462544N 1122031W	SAMPLE LOCATION	8N 6W 22CAB
STATION CODE		ANALYSIS NUMBER	77W1022
DATE SAMPLED	06-01-77	DRAINAGE BASIN	076G -CLARK FK R
TIME SAMPLED	1530	WATER FLOW RATE	10. GPM(M)
METHOD SAMPLED		FLOW MEASUREMENT METHOD	BUCKET+ TIME
SAMPLE SOURCE	MINE DRAIN	ALTITUDE OF LAND SURFACE	
WATER USE		TOTAL WELL DEPTH BELOW LS	At Helena Dougherty
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	(mine)
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

## SAMPLING SITE: ONTERIO MINE SEEP

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	52.	1.083
IRON (FE)			FLUORIDE (F)		
MANGANESE (MN)			PHOSPHATE (PO4 AS P)		
ALUMINUM (AL)			NO3+NO2 (TOT AS N)		
HYDROGEN (H+)	0.80	0.794			
SUM CATIONS	0.801	0.794	SUM ANIONS	52.000	1.083

LABORATORY PH	3.10	TOT HARDNESS (MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY (MG/L-CACO3)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (JTU)	
LAB CONDUCTIVITY-UMHOS-25C	595.0	SODIUM ADSORPTION RATIO	

## A D D I T I O N A L P A R A M E T E R S

LEAD, TR (MG/L AS PB)	.23	IRON, TR (MG/L AS FE)	27.
CADMIUM, TR (MG/L AS CD)	.015	COPPER, TR (MG/L AS CU)	.08
ZINC, TR (MG/L AS ZN)	3.3	MANGANESE, TR (MG/L AS MN)	1.2
ARSENIC, TR (MG/L AS AS)	4.5	SILVER, TR (MG/L AS AG)	< 0.01
MERCURY, TR (MG/L AS HG)	< 0.0002		

REMARKS: BOULDER BATHOLITH 0662

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER  
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
 (M)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 07	SAMPLER DP	HANDLING	ANALYST LAB	LAB
COMPLETED 09-16-77	COMPUTER RUN 09/27/77	DATA 0975/PROG 0876 FUND		
STND DEV. ION BALANCE 2.76	CA	MG	NA	K
SEGMENT MPDES	0.0	0.0	0.0	0.0
CALC. MEQ/L= INSUFFICIENT DATA				

77W1022



SITE NAME: ONTARIO MINE/MILL  
DATE: 23-Aug-90

18/1/92

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celsius)	COMMENTS	D.O. (mg/l)	TEMP °C
ADIT #1	7	3.04	405 654.7	5.5	SAMPLE COLLECTED	0.4	4
SEEP (BLW DUMP)	2	3.37	293 432.3	8.3		0.4	
ADIT #2	15	4.53		5.4		2.0	6
STREAM (DOWNGRADIENT)	24	3.54	215 320.6	8.5	SAMPLE COLLECTED, LOCATION AT ROAD WHICH IS NOT DOWNGRAD OF ALL TAILINGS		

SITE NAME: TELEGRAPH MINE  
DATE: 24-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celsius)	COMMENTS
ADIT #1	3-5	4.36	139 200.0	5.2	SAMPLE COLLECTED
SEEP (BLW ADIT)	2	5.33	92 137.2	8.5	
SEEP (BLW DUMP)	1-2	3.49	142 219.2	7.2	
STREAM	12	3.71	110 146.7	7.9	SAMPLE COLLECTED, ADIT DISCHARGE AND SEEPS COMBINE AND FLOW TO BRIM CK
ADIT #2	<1	6.53	36 58.2	5.5	

SITE NAME: MOUNTAIN VIEW MINE  
DATE: 24-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celsius)	COMMENTS
ADIT	6	8.34	173 284.7	6.1	SAMPLE COLLECTED
SEEP (BLW DUMP)	1	7.12	155 208.6	12.3	

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Ontario Adit Discharge

LAB NO: W8578

DATE RECEIVED: 09-14-90

Hardness 60 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.918 mg/L

Cd 0.0255 mg/L

Cu 0.27 mg/L

Fe 33.6 mg/L

Pb 0.212 mg/L

Zn 4.69 mg/L



REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Ontario Tailings

LAB NO: W8580

DATE RECEIVED: 09-14-90

Hardness 59 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.036 mg/L

Cd 0.0106 mg/L

Cu 0.08 mg/L

Fe 2.01 mg/L

Pb 0.004 mg/L

Zn 2.16 mg/L

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Ontario Mill Site Sample #2 Tailings--08/23/90

LAB NO: S2685

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 3.56 SU

Total Metals

As 1130 mg/Kg

Cd <1 mg/Kg

Cu 4 mg/Kg

Fe 2120 mg/Kg

Pb 2030 mg/Kg

Zn 13 mg/Kg

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Ontario Mill Site Waste Dump #1--08/23/90

LAB NO: S2686

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 3.33 SU

Total Metals

As 2600 mg/Kg

Cd <1 mg/Kg

Cu 26 mg/Kg

Fe 12.300 mg/Kg

Pb 1100 mg/Kg

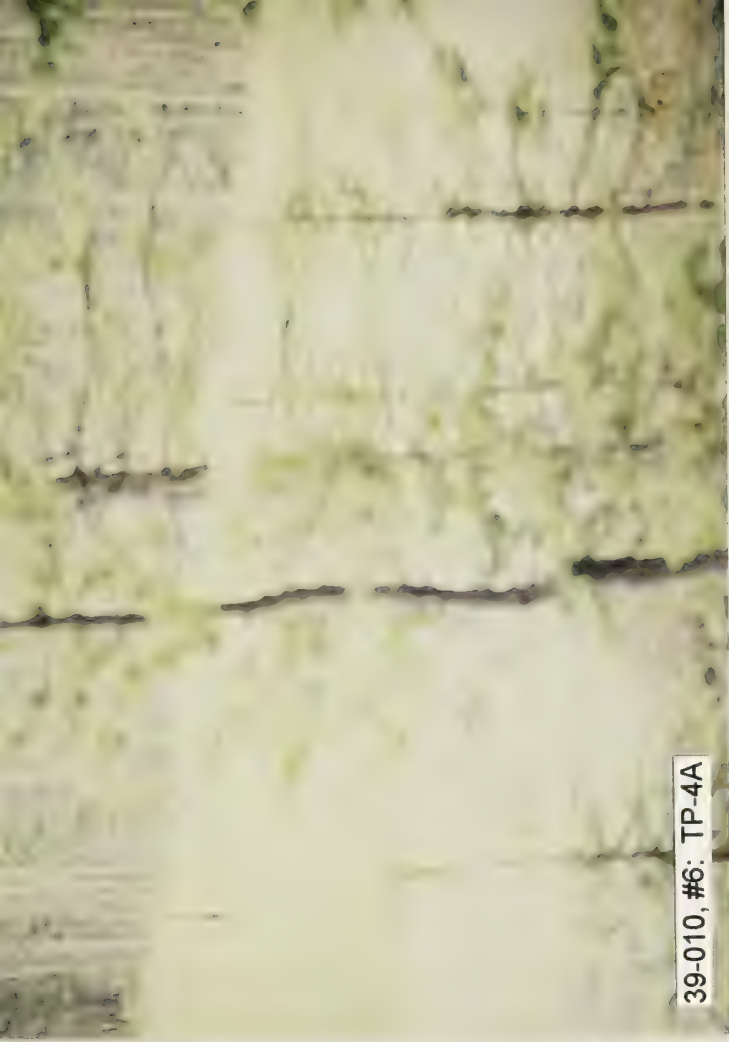
Zn 179 mg/Kg







39-010, #5: SW-2 sample location on unnamed tributary



39-010, #6: TP-4A



39-010, #7: TP-4A, 4B, and 4C (background)



39-010, #8: Drainage bottom between TP-4 and TP-3





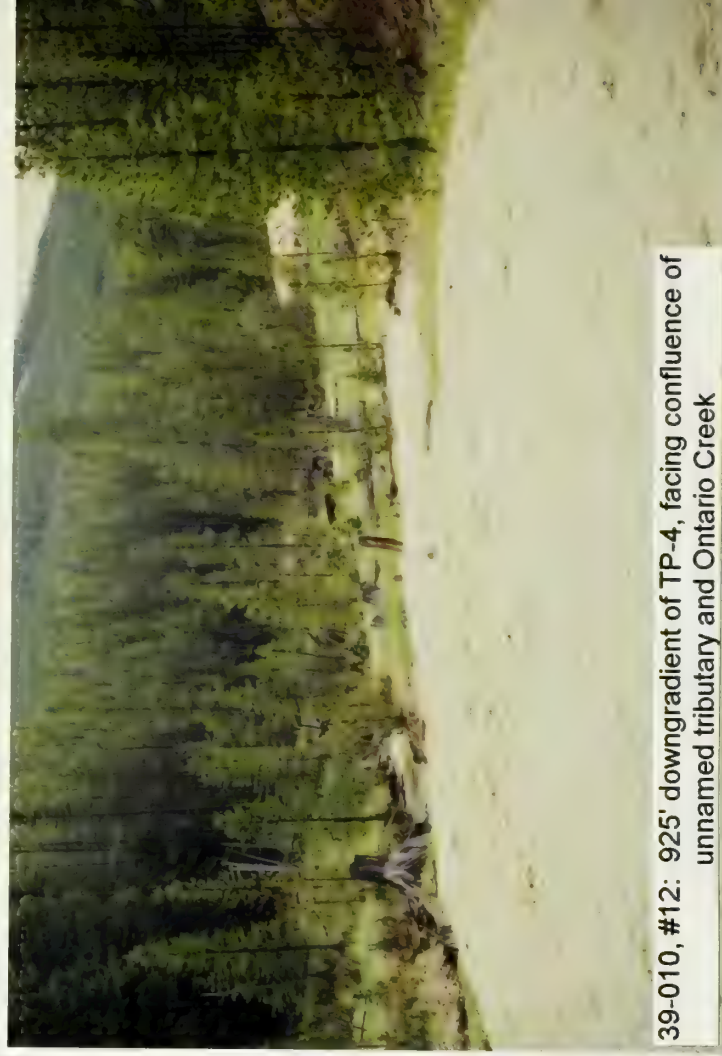
39-010, #9: TP-2



39-010, #10: TP-1



39-010, #11: Facing 500' downgradient of TP-4



39-010, #12: 925' downgradient of TP-4, facing confluence of unnamed tributary and Ontario Creek





39-010, #13: Adit #1 and discharge



39-010, #14: WR above mill

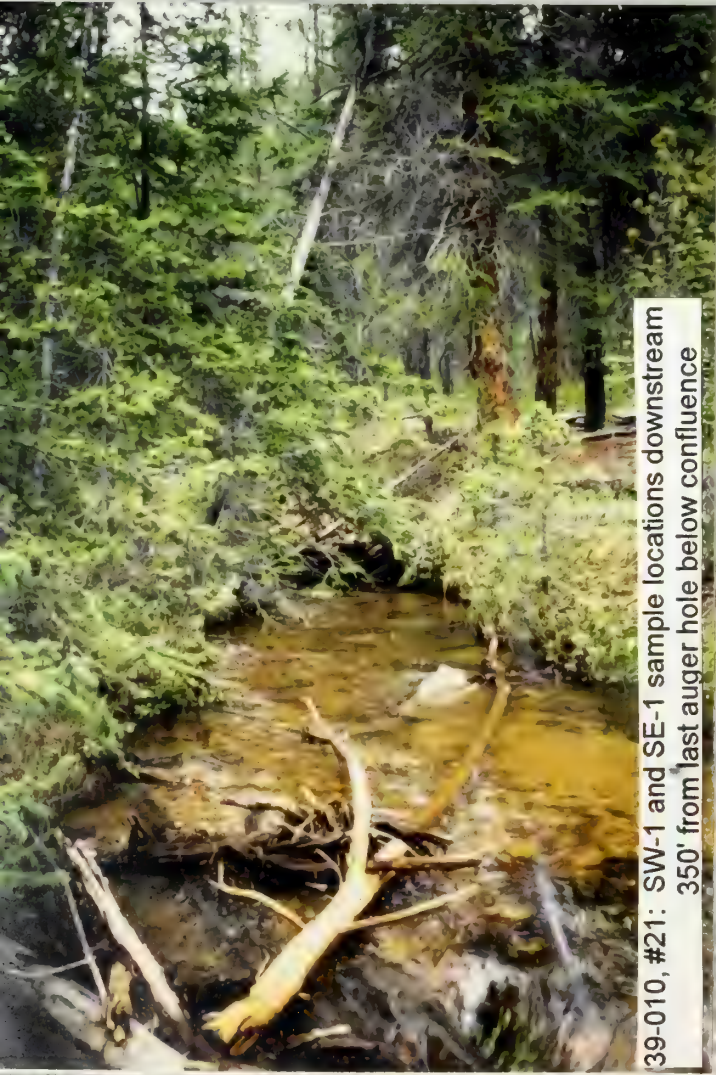


39-010, #15: Mill building

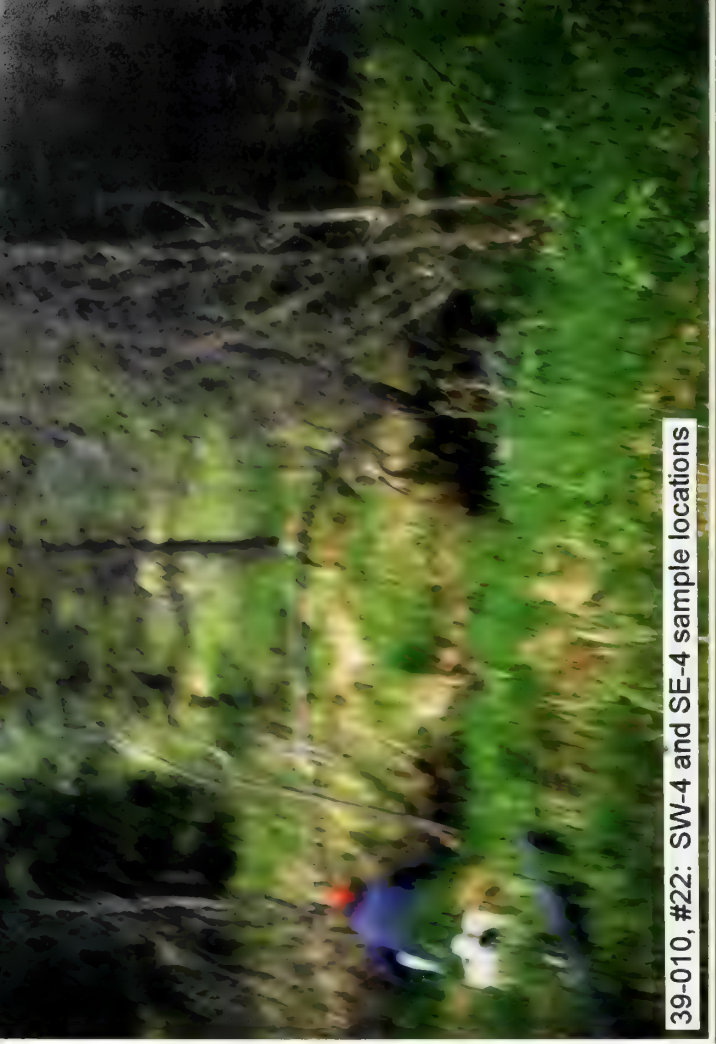


39-010, #16: WR





39-010, #21: SW-1 and SE-1 sample locations downstream 350' from last auger hole below confluence



39-010, #22: SW-4 and SE-4 sample locations



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: GOLDEN ANCHOR PA#: 39-012

Date: July 14, 1993 Time: 1145-1600

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer  
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Thunder, wind, hail, and heavy rain during investigation; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: SW-1 sample location; #2: Adit discharge as it flows across dump; #3: Adit #1; GW-1 location; #4: WR-1; #5: Highwall 1/4 mile above Adit #1; #6: Highwall and cut. Video Tape No. 4

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study treatment alternatives for elevated arsenic levels in adit discharge. Grade, amend, and revegetate dump material.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): GOLDEN ANCHOR PA#: 39-012

Legal Description: T 8N ; R 7W ; Sec. 1 , SW1/4 NE1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 28' 20" Longitude: W 112° 25' 27"

Primary Drainage Basin and Code: Little Blackfoot/17010201

Secondary Drainage Basin: Little Blackfoot

USGS Quadrangle map name(s): Bison Mountain

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX ☐ N ☐ ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Ben Sinerius,  
Box 492, Deer Lodge, MT 59722. (406) 846-1430; Helena National  
Forest.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 5620' , Slope 22° ,  
Aspect North

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? Approx. 1.5 acres.  
Dimensions:

Predominant vegetation types: Douglas Fir, Lodgepole pine, alder,  
raspberry on dump, grasses, lupine

Access: roads - good ☐ , poor ☐ , 4wd ☒ , trail ☐ .  
Other logistical considerations (proximity to other sites). Need  
to cross Blackfoot River; further up road is Mountain View Mine.



Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 4 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). The mine is situated on a small unnamed  
tributary to the Little Blackfoot River. Rhyolites are present in  
considerable volume southwest of Elliston along the Little  
Blackfoot River Valley.

Mining/milling history, ore type/tenor, host rock, gangue: Metal  
building; indicates some development work in the last 20 years. No  
other information available.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment Caved  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

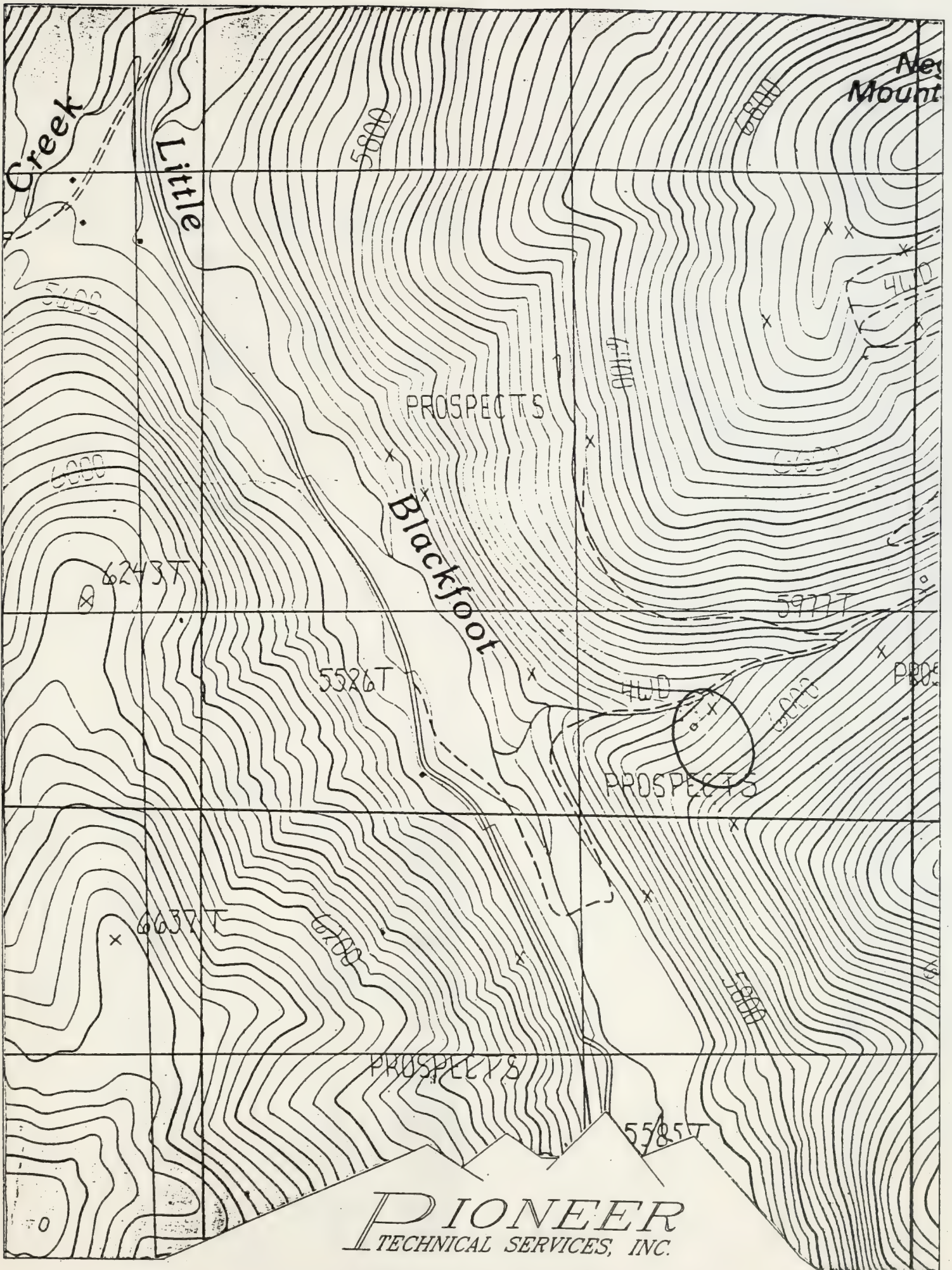


Montana Bureau of Mines and Geology  
Water Well Log Data

11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:57351	08N 07W 01 B	41.0	30.0	4.00
M:57353	08N 07W 02 A	40.0	50.0	30.00
M:57352	08N 07W 02 A	380.0	2.0	50.00
M:59258	09N 07W 35	149.0	29.0	73.00





GOLDEN ANCHOR, P.A. NO. 39-012

T08N, R07W, SECTION 01

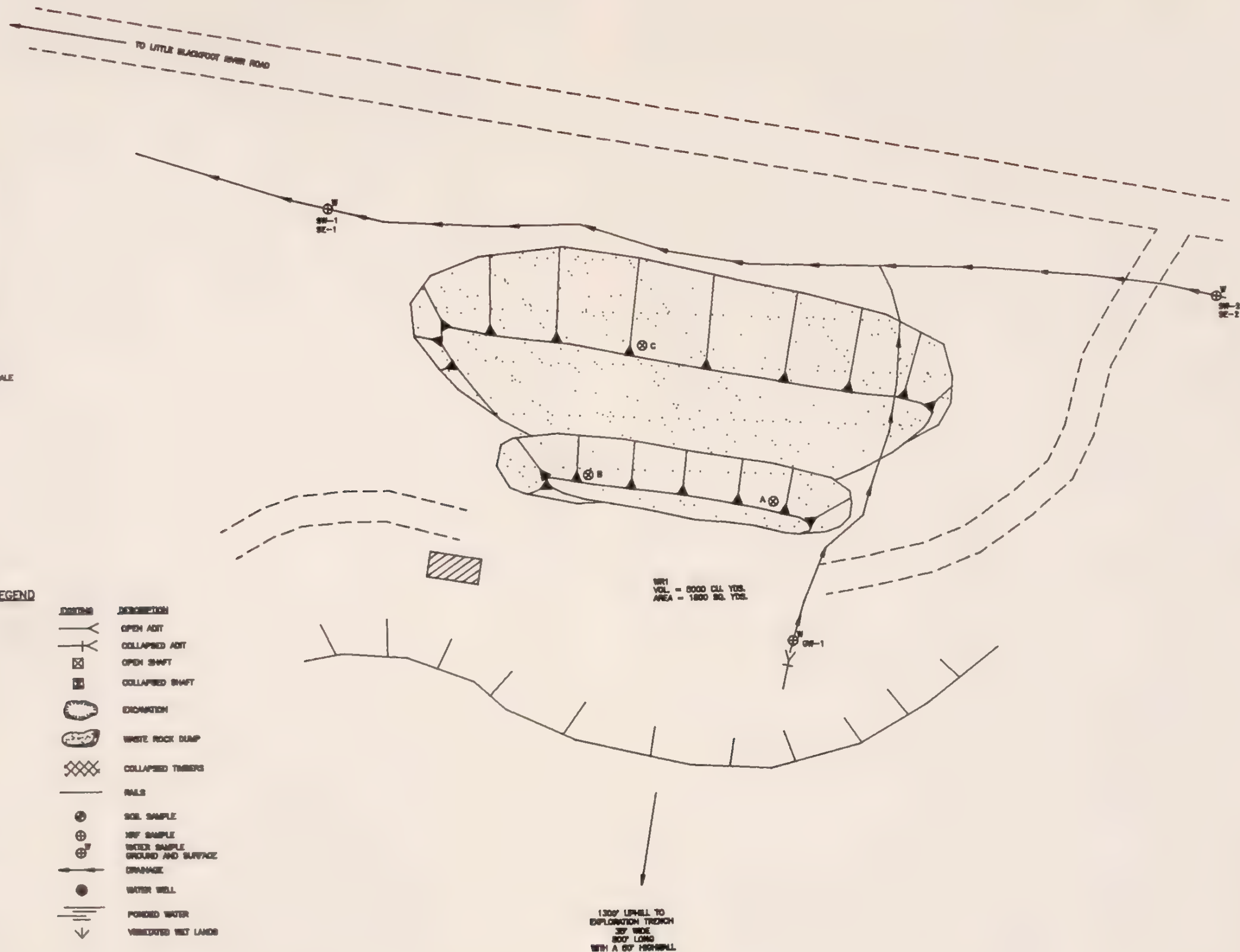
SCALE: 1" = 1000'





SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WHITE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARBER POST		SOIL SAMPLE
	GATE		WVF SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE
	EDGE OF GRNVEL		GROUND AND SURFACE DRAINAGE
	SLOPE DIRECTION		WATER WELL
	TAILINGS POND		PONDED WATER
			VERMICULATED WET LANDS

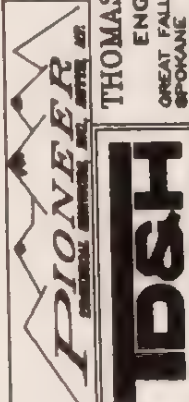
# LEGEND



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

GOLDEN ANCHOR PA# 39-012  
ELLISTON DISTRICT POWELL COUNTY

SHEET NO.



THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

DRAWN: JTP DATE: 18 NOV. 83  
DESIGNED: JTP JOB NO.: 93-17  
APPROVED: JTP F.B. NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





**SAMPLERS:** Bullock, Flammanq

[illegible]

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs: 39-012-WR-1 is composite of WR-1A through -1C.**

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number:     Identification: Adit #1

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes    , No X, Number:     Identification:    

Groundwater wells within 4 miles?: Yes X, No    ;  
Number of well logs: 37

Distance to nearest well used for drinking? Approx. 1/2 mile across the Little Blackfoot River (across a natural hydrologic divide)

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable    , Possible X, Unlikely    .

Metals concentrations in waste rock are elevated. Arsenic concentrations in the adit discharge are also elevated.

Other observations/notes: Frog/toad present in discharge stream; no stressed vegetation.



**SAMPLERS:** Bullock, Flammang

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Unnamed tributary to Little Blackfoot River

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-1 is right next to stream.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.6 during investigation  
High Flow: 2 cfs, Average Flow: 0.2 cfs

Distance between waste source(s) and nearest surface water body (ft)? Approx. 5 feet between base of WR-1 and unnamed tributary

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Adit #1 discharge drains over north end of WR-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, agricultural, wetlands, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? 500 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Arsenic was elevated in the 500 feet sediment sample.



**SAMPLERS:** Bullock, Flammang

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No flow taken upstream because of thunderstorm; flow increased dramatically after sample bottles were filled. Runoff may have impacted the representativeness of the upstream sample.

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 2 acres in drainage below the dump

Wetlands present: Yes X, No     , Describe: Associated with the drainage below the mine site

Carbonate rocks/soils: Yes     , No X, Describe:                     

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30 X; 30-100     ; 100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ; Comments                     

Nearest residence(ft or miles)? Approx. 1/2 mile

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed      high      moderate      low      none



**SAMPLERS:** Bullock, Flammanq

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Litter;  
people were observed in the vicinity of the mine.

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Bald Eagle  
Bat Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 3  
Sport Fishery Classification - 3

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Metal building on site

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 2,  
types and locations: Adit #1 is in highwall approx. 25'; second high-  
wall is 1/2 mile above lower adit and is 50' high.

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 1, types and locations: WR-1 slopes are steep and  
unvegetated.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



## **Bibliography**

MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Golden Anchor, Prepared by Daphne Digrindakis, August 30, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Golden Anchor, Prepared by Chen-Northern, June 15, 1988.

USGS, Topographic Map, Bison Mountain, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

GOLDEN ANCHOR  
PA NO. 39-012





Golden Anchor PA# 39-012  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-012-SE-1	247 J	69	6.6 J	19.2	1.7	8.6 JX	12200	0.084 J	1910	3 UJX	137 J	7 J	643 J	NR
39-012-SE-2	697 J	69.7	7 J	12.8	2.7	19.4 JX	20800	0.131 J	1200	4 UJX	454 J	12 J	726 J	NR
39-012-WR-1	323 J	379	3.1 J	3.3	3.9	17.2 JX	19500	0.074 J	310	2 UJX	80 J	29 J	329 J	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE t/1000	NEUTRAL. POTENT. t/1000	SULFUR ACID BASE POTENT. t/1000	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. t/1000	SULFUR
39-012-WR-1	2.84	88.7	52.6	-36.	1.3	40.6	12

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
39-012-GW-1	61.6	10.40	2.57 U	9.70 U	6.83 U	1.55 U	3610	0.260	953 J	12.7 U	1.42 J	30.7 U	208 J	80.9
39-012-SW-1	30.6	5.87	2.57 U	9.70 U	6.83 U	1.55 U	188	0.230	58.5 J	12.7 U	1.85 J	30.7 U	183 J	69
39-012-SW-2	27.9	6.77	2.57 U	9.70 U	6.83 U	23.10	154	0.094	18.4 J	12.7 U	2.19 J	30.7 U	152 J	65.4

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-012-GW-1	201	6.3	55	< 0.05	NR
39-012-SW-1	271	< 5.0	58	< 0.05	NR
39-012-SW-2	151	< 5.0	57	< 0.05	NR

LEGEND

SE1 - Downstream of waste rock dump 1.  
SE2 - Above access road to mine approx. 40'.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From the Charter Oak (39-003-SS-1).  
GW1 - At the mouth adit #1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**XRF ANALYSIS RESULTS**

**GOLDEN ANCHOR  
PA NO. 39-012**





XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-012-SE-500		17141.3	8429.8	1488.51		3321.7	25397.4	255.728 *	53.2176 *	1044.17	652.358	279.788
39-012-WR1-A		24511.1	39132.6	1395.4		276.459 *	21397.9			162.539	705.9	102.052
39-012-WR1-B		25149.5	14923	1012.26	217.587 *	854.815 *	13719.3		55.3838 *	442.3	336.196	187.992
39-012-WR1-C		24896.7	27614.4	1556.2		853.408 *	19583.2		45.9346 *	387.002	644.922	242.945
39-012-WR1-C-DUP		23816.9	29495.5	1404.5		832.57 *	19691.7			389.548	580.068	178.624
39-012-WR-1-COMP		24415.8	27189.3	1243.34	176.891 *	534.644 *	18745.2			544.55	546.882	157.093
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-012-SE-500	212.26			277.148	138.157			809.819			16.7095 *	
39-012-WR1-A	154.125			228.875	211.195		182.322 *	703.96			14.8303 *	
39-012-WR1-B	150.812		4.80578 *		131.115			500.221		10.7034 *	18.8309 *	
39-012-WR1-C	205.985			61.318 *	134.275			1540.21			19.0105 *	
39-012-WR1-C-DUP	182.81			102.87	161.262	139.282 *	72.1184 *	765.728			16.7405 *	
39-012-WR-1-COMP	167.586			96.9585	171.935		64.6329 *	806.895			16.5384 *	

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

GOLDEN ANCHOR  
PA NO. 39-012





# AIMSS SCORESHEET

SITE NAME: GOLDEN ANCHOR  
PA NUMBER: 39-012

LINE NO.			PA NUMBER:	39-012
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.202
6	GW - TARGETS	WELLS - 1 MI. x 2.5		10.0
7		WELLS - 1 TO 4 MI		33
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	48.0
10	<b>GROUNDWATER SCORE</b>		LINES 4 x 5 x 9	80678
<b>SURFACE WATER PATHWAY</b>				
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.319
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	28
24	<b>SURFACE WATER SCORE</b>		LINES 14 x 15 x 23	48373
<b>AIR PATHWAY</b>				
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28		CALCULATED SCORE	(SEE WORKSHEET)	0.024
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		5
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	30
35	<b>AIR PATHWAY SCORE</b>		LINES 27 x 28 x 34	72
<b>DIRECT CONTACT PATHWAY</b>				
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	250
39		CALCULATED SCORE	(SEE WORKSHEET)	0.023
40	D. C. WASTE CHAR. TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	11
44	<b>DIRECT CONTACT SCORE</b>		LINES 38 x 39 x 43	63
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b> (LINES 10 + 24 + 35 + 44) / 100,000			1.29

SITE NAME:  
PA NUMBER:

GOLDEN ANCHOR  
39-012

LINE  
NO.

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	150
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	190
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	11
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>41.80</b>





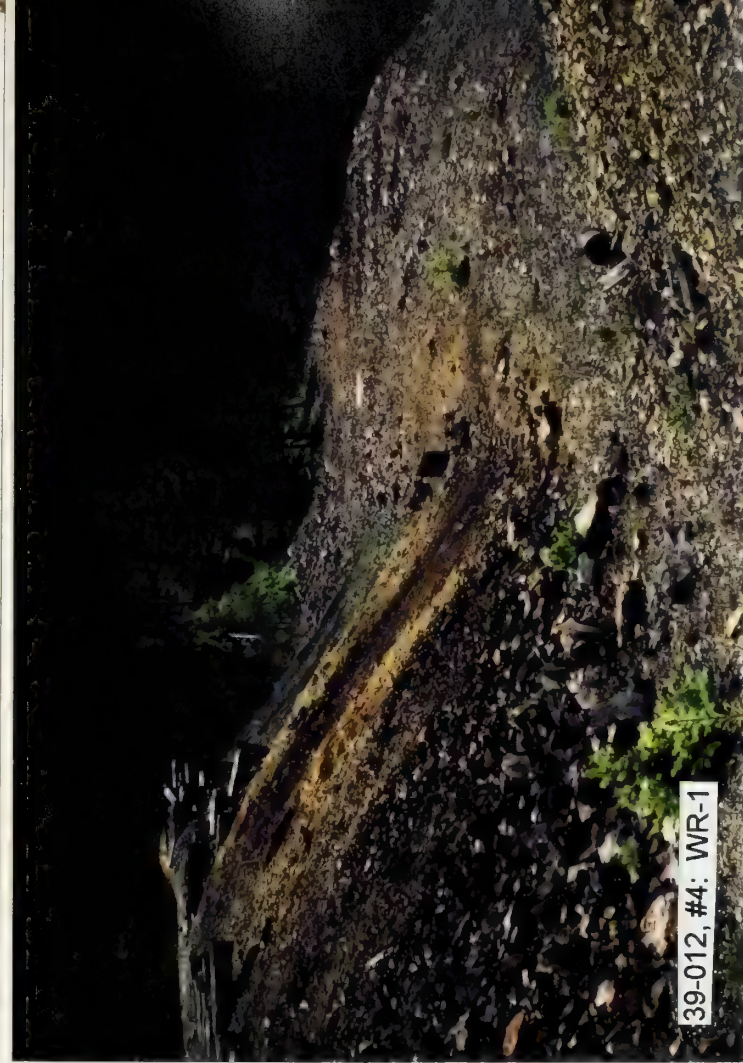
39-012, #1: SW-1 and SE-1 sample locations



39-012, #2: Adit #1 discharge flows across the dump



39-012, #3: Adit #1; GW-1 sample location

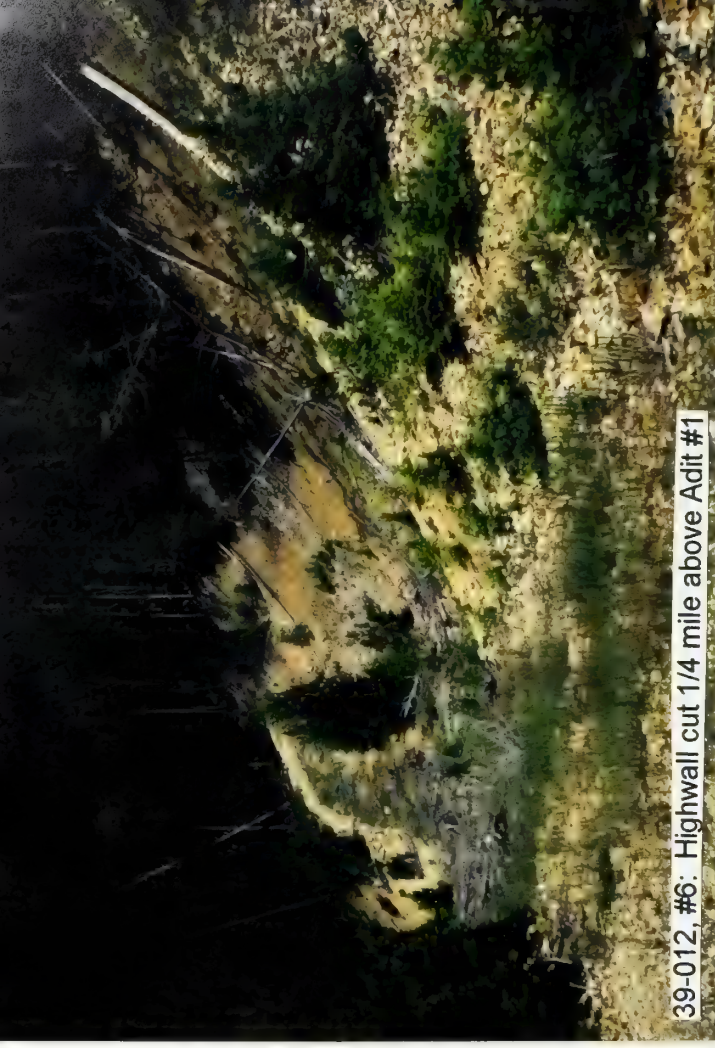


39-012, #4: WR-1





39-012, #5: Highway 1/4 mile above adit



39-012, #6: Highway cut 1/4 mile above Adit #1



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: HARD LUCK PA#: 39-014

Date: July 14, 1993 Time: 1000-1230

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy to overcast; cool,  
wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #8,#9: HMO shaft;  
#10: WR-1 from shaft; #11: WR-2, small adit to west; #12: Adit  
(open); #13,#14: WR-3; #15: GW-1 location. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site was by helicopter.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Fill upper  
shaft HMO or grate/fence; very dangerous. On lower adits and  
dumps, close HMO and contour/revegetate dumps with additives.  
Discharge is currently piped away from dump, but may want to  
replace metal pipe with a more permanent piping.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): HARD LUCK PA#: 39-014

Legal Description: T 8N ; R 6W ; Sec. 21 , NW1/4SW 1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 25' 43" Longitude: W 112° 22' 12"

Primary Drainage Basin and Code: Ontario Creek/17010201

Secondary Drainage Basin: Ontario Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Silver, Zinc, Lead, Copper, Gold

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Helena National Forest.

Relationship to other mines/sites in the area/district: Down the drainage from the Ontario, Lily/Orphan Boy, and Sure Thing sites.

Regulatory Status (Activity by other agencies)? Hardrock permits?       
Past Reclamation Activities? N/A

General site features: Elevation 6500' , Slope 40° ,  
Aspect South

Land use: Mining      , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 0.3 acres.  
Dimensions:     

Predominant vegetation types: Lodgepole pine forest

Access: roads - good      , poor      , 4wd X , trail      .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on the northeast side of Ontario Creek. Water leaving the site would flow approx. 1,000 feet south into perennial Ontario Creek, which then would flow northwest away from the site. Approx. 2 1/2 miles below the site, Ontario Creek flows into the Little Blackfoot River. The site is underlain by quartz monzonite and contains vein mineralization.

Mining/milling history, ore type/tenor, host rock, gangue: The ore minerals pyrite and sphalerite occur in quartz and manganocalcite gangue.

Mine Operation?

Shafts - Yes X, No     , # 1, Comment Inclined shaft  
Adits - Yes X, No     , # 2, Comment 1 small caved; 1 large main adit  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

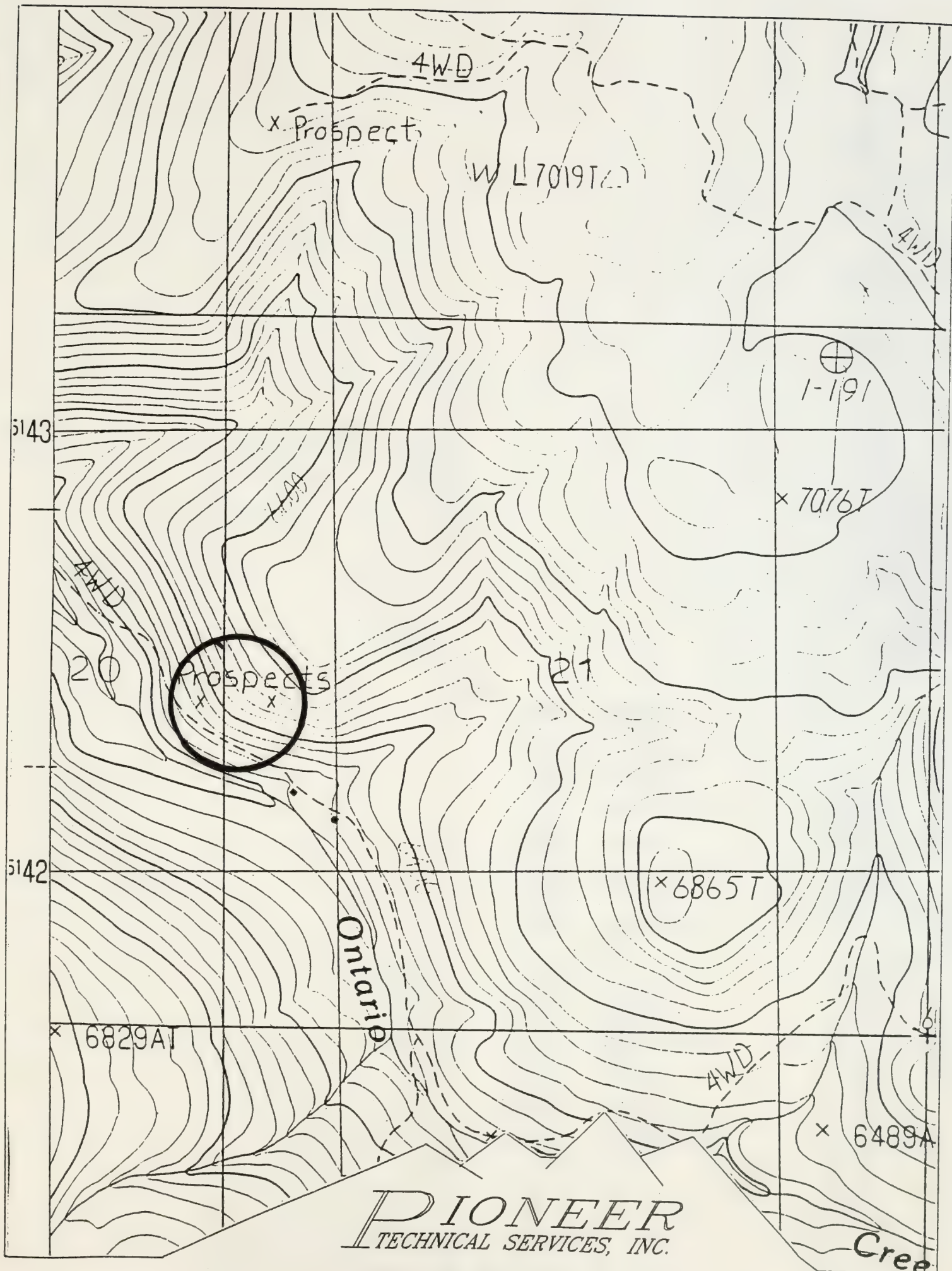


Montana Bureau of Mines and Geology  
Water Well Log Data

11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M.37348	08N 06W 16 AAC	50.0	15.0	0.00





**PIONEER**  
TECHNICAL SERVICES, INC.

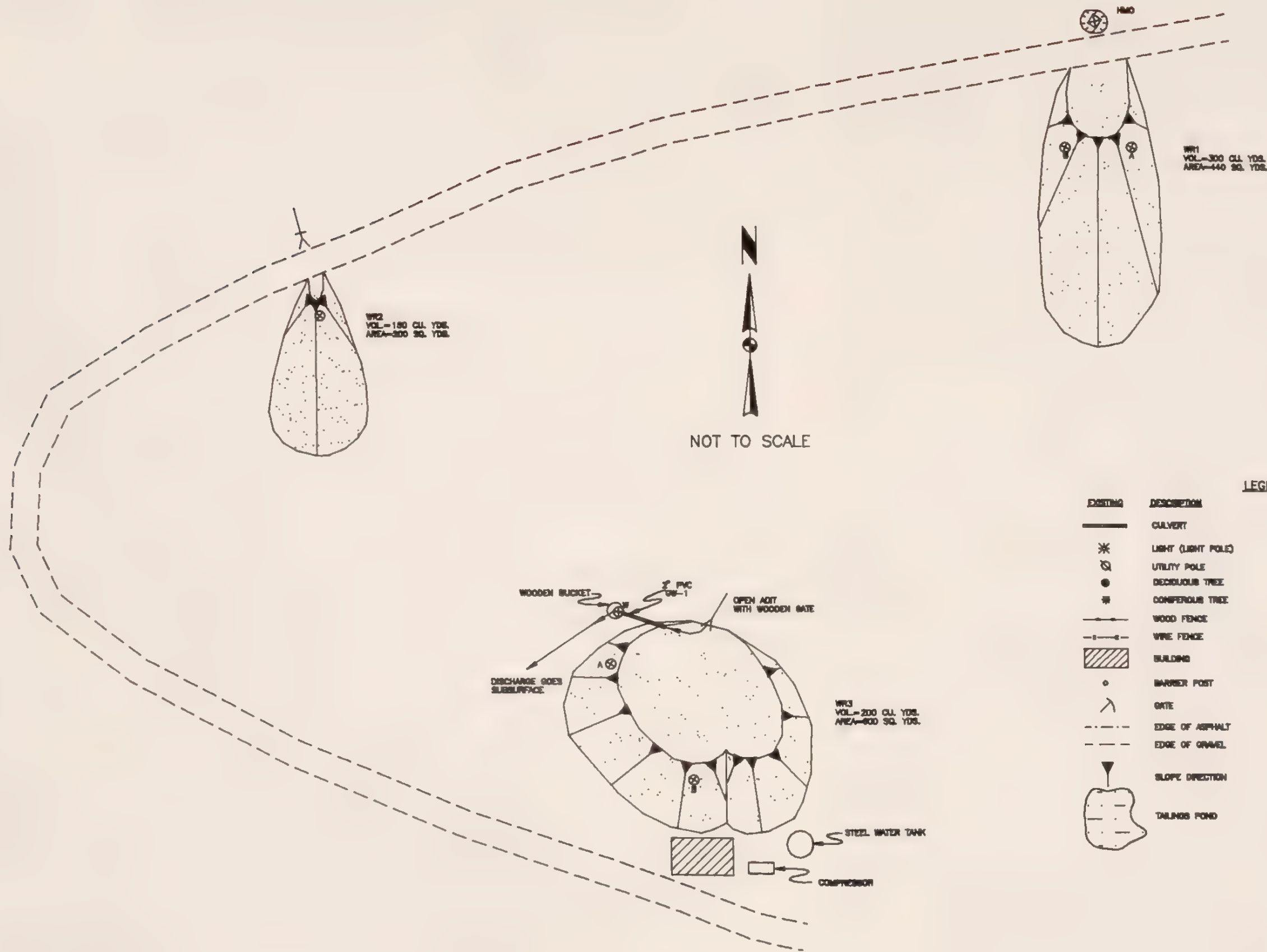
HARDLUCK, P.A. NO. 39-014

T08N, R06W, SECTION 21

SCALE: 1" = 1000'







SYMBOL	DESCRIPTION
—	CULVERT
*	LIGHT (LIGHT POLE)
⊙	UTILITY POLE
●	DECIDUOUS TREE
⊗	CONIFEROUS TREE
— —	WOOD FENCE
— — —	WIRE FENCE
▨	BUILDING
•	BARRIER POST
∧	GATE
- - -	EDGE OF ASPHALT
- - -	EDGE OF GRAVEL
▲	SLOPE DIRECTION
⬮	TAILINGS POND

# LEGEND

SYMBOL	DESCRIPTION
— —	OPEN ADIT
— — —	COLLAPSED ADIT
⊕	OPEN SHAFT
⊗	COLLAPSED SHAFT
⬮	EXCAVATION
⬮	WASTE ROCK DUMP
⬮	COLLAPSED TIMBERS
— —	RAILS
⊕	LAB SAMPLE
⊕	XRF SAMPLE
⊕	WATER SAMPLE
⊕	GROUND AND SURFACE
— —	DRAINAGE
●	WATER WELL
⬮	PONDED WATER
⬮	VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

HARD LUCK PA# 39-014  
ELLISTON DISTRICT POWELL COUNTY

DRAWN JTP DATE 18 NOV 93  
DESIGNED JPR JOB NO. 93-17  
APPROVED MJG F.B. NO.

PIONEER  
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A





# SOURCE INVENTORY FORM

**SAMPLERS:** Tuesday, Belanger

[illegible]<sup>1</sup> D-Direct rendering (Relay Master); S-Saturated Paste (Orion Master)

Comments or deviations from SOPs: 39-104-WR-1 is composite of WR-1A and -1B. 39-014-WR-2 is composite of WR-3A and -3B.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Adit #2  
(piped discharge)

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes     , No X, Number:      Identification:     

Groundwater wells within 4 miles?: Yes X, No     ;  
Number of well logs: 15

Distance to nearest well used for drinking? > 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable     , Possible X, Unlikely     .

Metal values in uncontained dumps are, in some cases, very elevated;  
water flowing out of adit, groundwater fairly shallow, but high pH.

Other observations/notes: N/A



**SAMPLERS:** Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Ontario Creek is approx. 1/4 mile below the site.

Dry streambeds: Yes     , No X, Name(s):                     

Other surface water: Yes X, No     , Name(s)/Description: Discharge from open adit (GW-1) seeps into the ground.

Waste materials within any floodplain: Yes     , No X Source ID(s):     

Approximate Flood frequency?      1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A  
High Flow:                     , Average Flow:                     

Distance between waste source(s) and nearest surface water body (ft)? > 1,000 feet to Ontario Creek; small adit discharge is piped around the dump.

Surface water draining onto or through waste sources: Yes     , No X,  
Describe: Adit discharge flows through a pipe that flows west of the dump.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Little Blackfoot River is 2 1/2 miles below the site and has fishery, recreation, agriculture, irrigation, and possible residential.

Observed erosional/sedimentation/stream turbidity problems? Yes     , No X, Distance downstream (ft)?                      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): N/A



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? > 1 acre

Wetlands present: Yes     , No X, Describe:                     

Carbonate rocks/soils: Yes     , No X, Describe:                     

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30 X; 30-100     ;  
100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or  
greater     ; Comments   

Nearest residence(ft or miles)? 1.8 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS:** Tuesday, Belanger

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Beer  
cans

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>3</u>
Sport Fishery Classification -	<u>3</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
One adit, partially caved, west side; one shaft, caved but 15' bgs.

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Building at adit on west side.

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



## Bibliography

Great Falls (MT) Tribune, "Miner Says Law Unconstitutional," July 14, 1981.

MBMG, Form 39, Hard Luck, Powell County, 1967-69, 1971, 1976.

MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin No. 98, Written by H.G. McClernen, April 1976.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet, Prepared by Tierra Buena Contracting, December 27, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Hard Luck site, Prepared by Northern Engineering and Testing, June 7, 1988.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1989.



LABORATORY ANALYTICAL DATA

HARD LUCK  
PA NO. 39-014





Hard Luck PA# 39-014  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-014-WR-1	3750 J	16.7	6 J	9.6	1.9	13.3 JX	52400	0.061 J	26500	7 JX	151 J	15 J	492 J	NR
39-014-WR-2	4290 J	70.2	3.3 J	1.5 U	1.1 U	55.1 JX	17300	0.391 J	8.1	2 UJX	16500 J	314 J	97 J	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000	%	1/1000
39-014-WR-1	1.6	50	119	69.3	0.44	27.2	0.29	92.1						
39-014-WR-2	0.76	23.7	-0.3	-24.	0.72	0.31	0.03	-0.65						

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. Zn (mg CaCO3/L)
39-014-GW-1	31.7 J	2.01 U	2.57 U	9.70 U	6.83 U	1.55 U	23.7	0.038 U	4.08 U	12.7 U	0.72 U	30.7 U	7.57 U	62.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N CYANIDE
39-014-GW-1	116 <	5.0	24 <	0.05 NR

LEGEND

WR1 - Composite of subsamples WR1A and 1B.  
WR2 - Composite of subsamples WR3A and 3B.  
BACKGROUND - From the Ontario Millsite (39-010-SS-1).

GW1 - Adia discharge.



XRF ANALYSIS RESULTS

HARD LUCK  
PA NO. 39-014





XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-014-WR1-A		64169.8	2123.31	840.274			32450.8		64.0605 *	117.605 *	6704.36	84.91
39-014-WR1-B		53044.7	2036.52	591.859			27225.3			121.013 *	7163.6	67.0276
39-014-WR3-A		24785.3	19786.3	1171.74	147.808 *	8282.74	26152.9			822.935	2263.27	186.681
39-014-WR3-B		38287.1	16611.9	613.914		7563.15	11190.3			485.982	375.315	38.1201
39-014-WR-1-COMP		28035.4	17715.2	980.454		8792.86	20958.8			710.789	2060.55	126.641
39-014-WR-2		27596.1	1741.03	605.504		1489.76	22773.5			422.753	2010.84	39.6933
39-014-WR-2-COMP		58245.3	2589.04	876.537			27018.4			98.9758 *	7052.29	58.6499
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-014-WR1-A	252.226		71.565	16302.4	232.587	301.392 *	1055.82	863.743	253.672 *		70.3707 *	
39-014-WR1-B	210.74		85.6815	12458.9	201.392		709.471	764.406	252.922 *		35.7329 *	
39-014-WR3-A	201.272	41.7126 *	5.96051 *	184.571	153.21			483.471	146.109 *		11.2599 *	
39-014-WR3-B	148.882	40.4399 *	29.5009	120.11	203.74			203.154	110.787 *		26.8786	
39-014-WR-1-COMP	199.009	50.5413 *	15.5796 *	201.762	172.816		40.1296 *	407.595	74.6925 *		17.1942 *	
39-014-WR-2	107.741	41.1489 *	7.0354 *	4930.37	150.322		175.314	346.209	101.336 *			
39-014-WR-2-COMP	246.113		46.3463	11182.3	186.623		683.637	821.453	191.561 *		31.58 *	

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

HARD LUCK  
PA NO. 39-014





# **AIMSS SCORESHEET**

SITE NAME: **HARD LUCK MINE**  
PA NUMBER: **39-014**

LINE NO.				
<b><u>GROUNDWATER PATHWAY</u></b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7.515
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		14
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	16.5
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>24800</b>
<b><u>SURFACE WATER PATHWAY</u></b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	8.024
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	22
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>7061</b>
<b><u>AIR PATHWAY</u></b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.264
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	20
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>264</b>
<b><u>DIRECT CONTACT PATHWAY</u></b>				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.247
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 THRU 42	2
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>74</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			
	(LINES 10 + 24 + 35 + 44) / 100,000			<b>0.32</b>

SITE NAME: HARD LUCK MINE  
PA NUMBER: 39-014

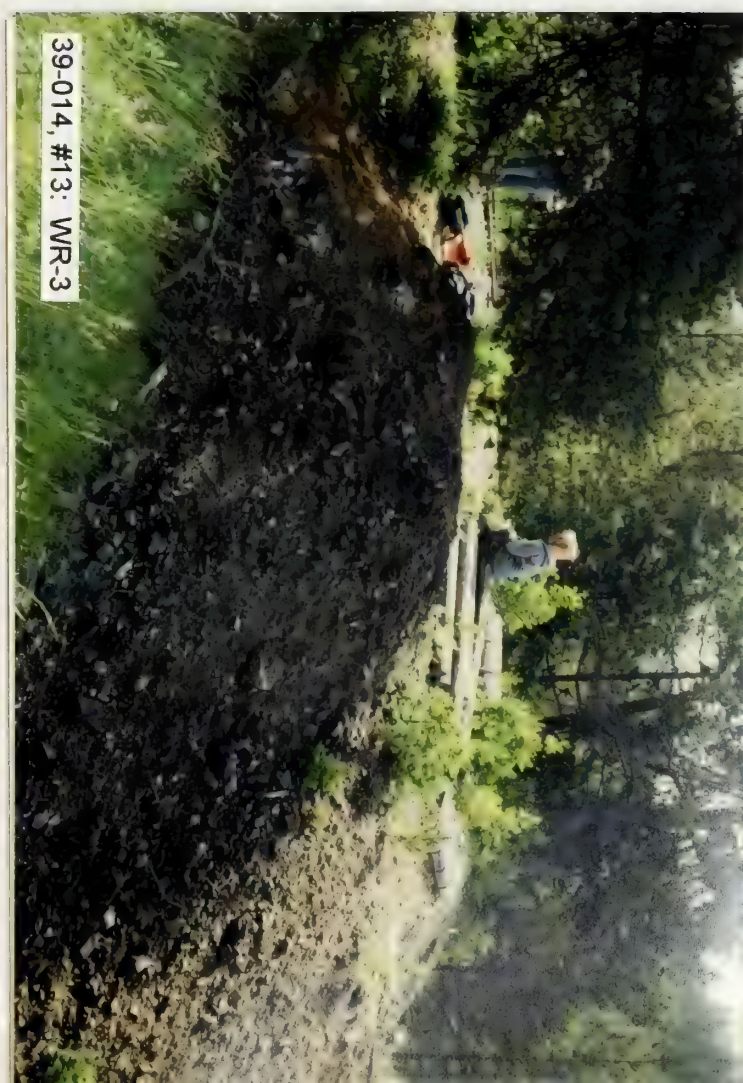
LINE NO.	SITE SAFETY		
1	THREAT	ACCESSIBILITY	20
2	HAZARDS	OPEN SHAFTS	100 EA.
3		OPEN ADITS	50 EA.
4		UNSTAB. HIWALLS / PITS	75 EA.
5		HAZ. STRUCTURES	40 EA.
6		EXPLOSIVES	0
7		HAZ. MATERIALS	0
8		HAZARDS SCORE	SUM LINES 2 THRU 7
9	TARGETS	POPULATION - 1 MILE	190
10		NEAREST RESIDENCE	0
11		RECREATIONAL USE	0
12		TARGETS SCORE	SUM LINES 9 THRU 11
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000

7.60





39-014, #12: Adit (open)



39-014, #13: WR-3



39-014, #14: WR-3



39-014, #15: GW-1 sample location



NE  
014  
20  
00  
50  
0  
40  
0  
0  
90  
0  
0  
2  
2  
60

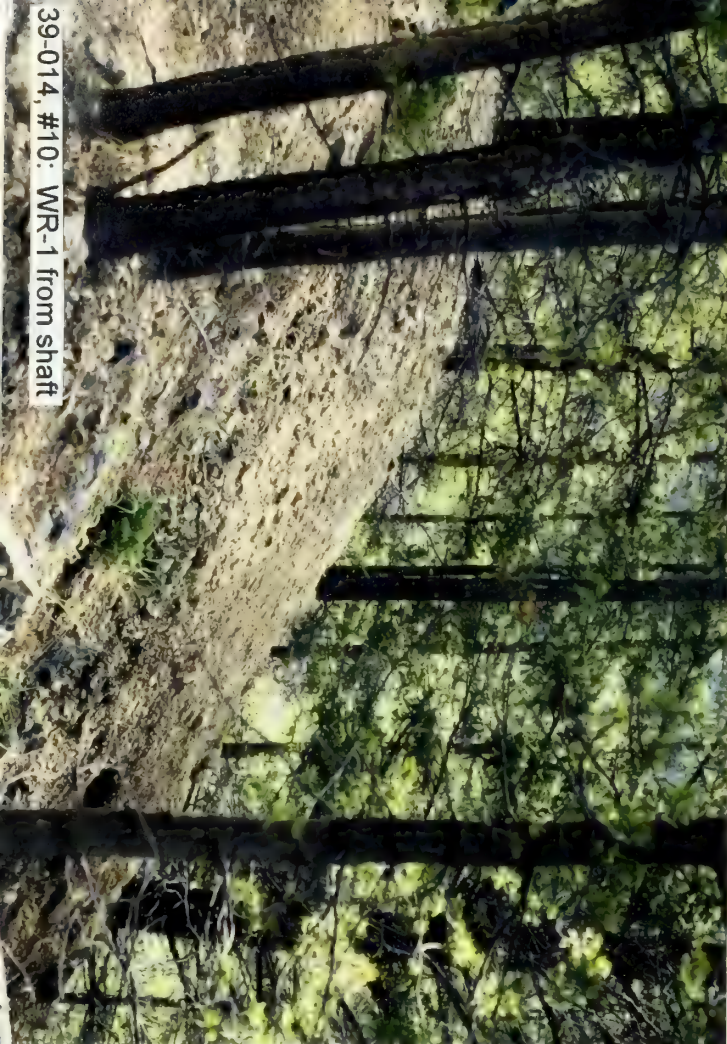


TY  
PIT  
LE  
CE  
E  
ORE

39-014, #9: Shaft and HMO



39-014, #10: WR-1 from shaft



39-014, #11: WR-2 and small adit to the west





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: KIMBALL PA#: 39-018

Date: August 18, 1993 Time: 1200-1250

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Pierson, TD&H  
Belanger, Pioneer

Visitors: None

Weather/Seasonality Observations: Clear; sunny; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #13: WR-3 and Adit #3; #14: Adit #2; #15: WR-2 and loadout; #16: WR-1 and Adit #1 culvert closure. Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Grade, amend and revegetate the waste rock dumps.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): KIMBALL PA#: 39-018

Legal Description: T 8N ; R 7W ; Sec. 12 , NW1/4 NE1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 27' 49" Longitude: W 112° 25' 04"

Primary Drainage Basin and Code: Little Blackfoot/17010201

Secondary Drainage Basin: Little Blackfoot

USGS Quadrangle map name(s): Bison Mountain

Mine Type/Commodities: Hardrock/Lead, Silver, Gold, Zinc, Copper

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known ☒ N ☐ ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): USFS; Solar Silver Mining Co., Spokane, WA 99201.

Relationship to other mines/sites in the area/district: Near the Golden Anchor mine

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? AMRB culvert closure at WR-3.

General site features: Elevation 5660' , Slope 15°-25° ,  
Aspect West

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☐ , Other (Specify) ☐

Area of disturbed/unvegetated lands? 3 acres.  
Dimensions:

Predominant vegetation types: Douglas Fir, Lodgepole pine, grasses, raspberry

Access: roads - good ☐ , poor ☐ , 4wd ☒ , trail ☒ .  
Other logistical considerations (proximity to other sites).   
Difficult high flow stream crossing



Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 3 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on hillside east of the Little  
Blackfoot River. The site is approx. 1/4 mile from the river and  
is separated by a broad, well vegetated floodplain. Little  
Blackfoot flows northwest away from the site. The site is  
underlain by andesite.

Mining/milling history, ore type/tenor, host rock, gangue: History  
is unknown. The adits intersect a vein in andesite. Gangue is  
quartz and mineralization is pyrite and auriferous pyrite.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 3, Comment 2 caved; 1 closed  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting?  
N/A

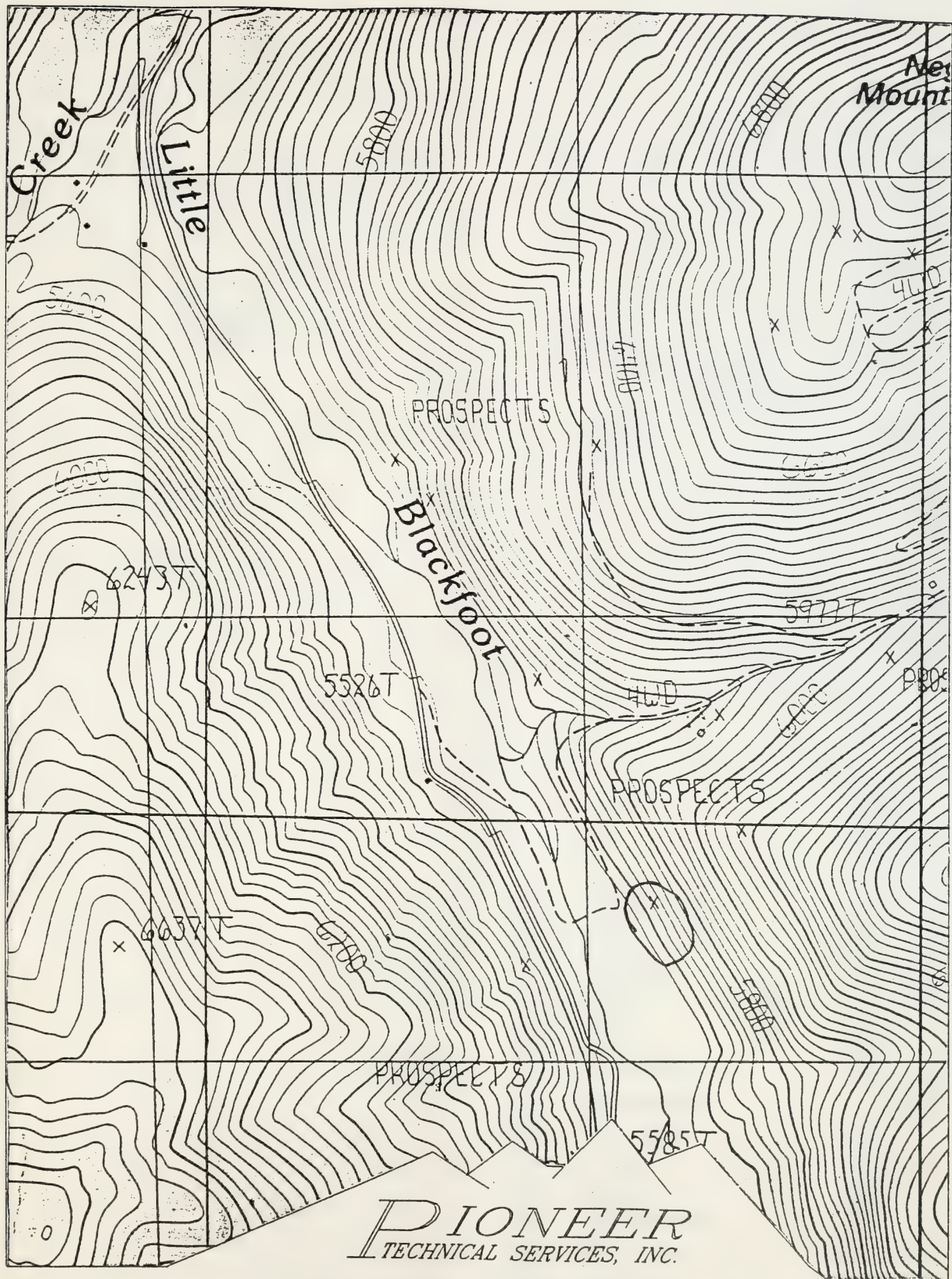


Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:57351	08N 07W 01 B	41.0	30.0	4.00
M:57353	08N 07W 02 A	40.0	50.0	30.00
M:57352	08N 07W 02 A	380.0	2.0	50.00





*PIONEER*  
TECHNICAL SERVICES, INC.

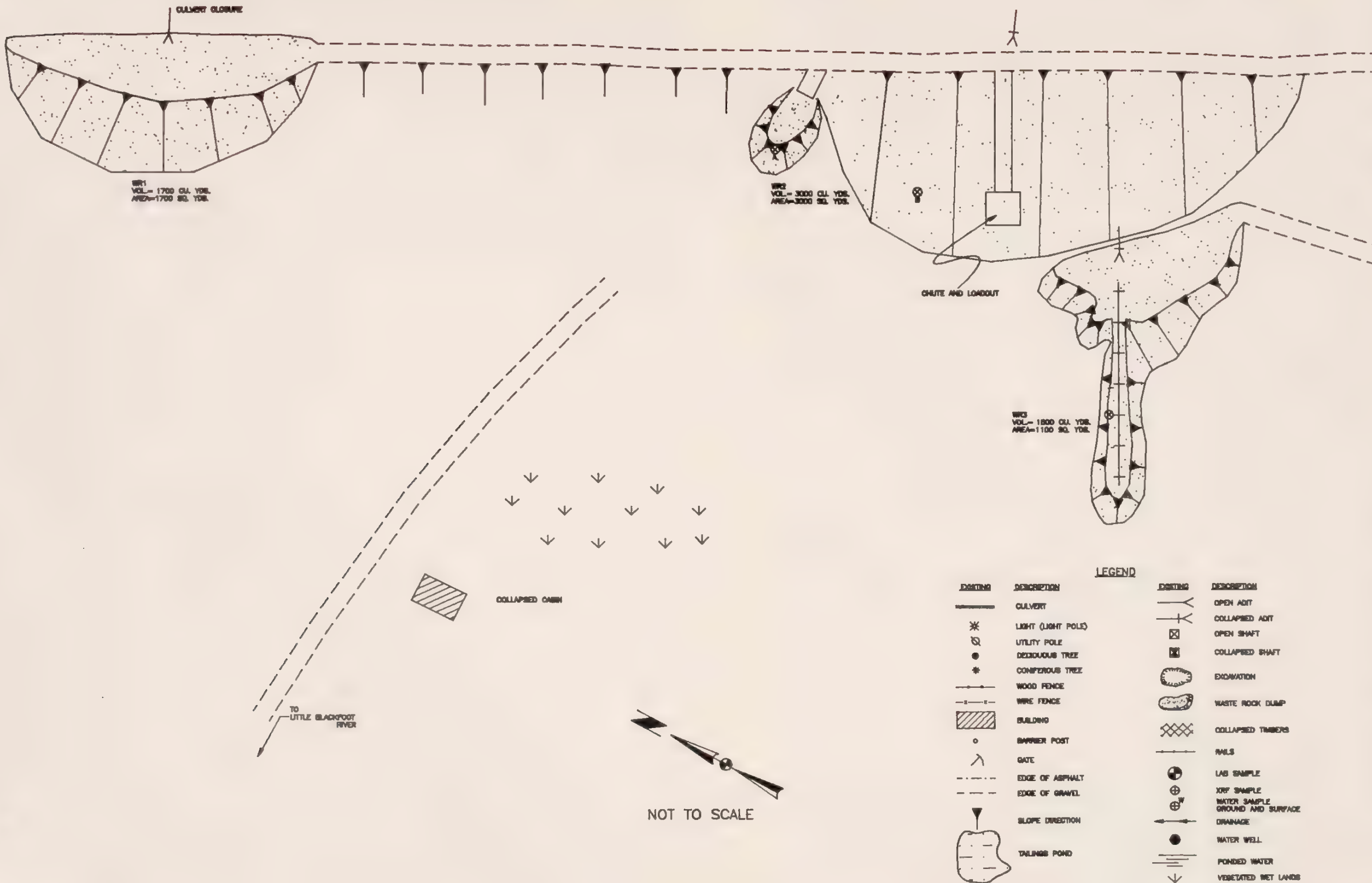
KIMBALL, P.A. NO. 39-018

T08N, R07W, SECTION 12

SCALE: 1" = 1000'







MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

KIMBALL PA# 39-018  
ELLISTON DISTRICT POWELL COUNTY

SHEET NO.

DRAWN JTP DATE 18 NOV 93  
DESIGNED TPR JOB NO. 93-17  
APPROVED MJB F.B. NO.

**PIONEER**  
ENGINEERING, INC.  
THOMAS, DEAN & HOSKINS, INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS - BOZEMAN - KALISPELL  
SPOKANE MONTANA WASHINGTON



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A





**SAMPLERS:** Bullock, Belanger

<sup>9</sup> D-Direct Feeding (Kulvey Motor); S-Saturated Pasta (Orion Motor)

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## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;

Number of well logs: 23

Distance to nearest well used for drinking? 0.4 miles across the Little Blackfoot River, which represents a hydrologic divide.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible\_\_\_, Unlikely X.

Workings appear to be relatively shallow; dumps are dry.

Other observations/notes: N/A



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Dry streambeds: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Other surface water: Yes X, No\_\_\_\_, Name(s)/Description: Small wetlands (approx. 1/4 acre)

Waste materials within any floodplain: Yes\_\_\_\_, No X Source ID(s):\_\_\_\_\_

Approximate Flood frequency?\_\_\_\_1 yr,\_\_\_\_10 yr,\_\_\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A  
High Flow:\_\_\_\_, Average Flow:\_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)?  
200 feet from base of WR-3 to the wetlands, isolated by topography.

Surface water draining onto or through waste sources: Yes\_\_\_\_, No X,  
Describe:\_\_\_\_\_

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Fishery, recreation, wetlands, agriculture, irrigation, possible residential

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_,  
No X, Distance downstream (ft)?\_\_\_\_\_ Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present): \_\_\_\_\_



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 to 10 acres

Wetlands present: Yes X, No     , Describe: Small wetlands approx. 200  
feet from WR-3

Carbonate rocks/soils: Yes ☐, No ☒ , Describe: \_\_\_\_\_

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30 X; 30-100\_\_\_;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments\_\_\_\_\_

Nearest residence(ft or miles)? 0.4 miles across the Little Blackfoot

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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**SAMPLERS:** Bullock, Belanger

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Camp  
sites are located below the mine. \_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment _____
Wilderness Area -	Yes____, No <u>X</u> , Comment _____
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Bald Eagle</u>
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 3  
Sport Fishery Classification - 3

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Old loadout

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations: \_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: \_\_\_\_\_



## Bibliography

MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Kimball, Prepared by Tierra Buena Contracting, December 27, 1988.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Kimball, Prepared by Northern Engineering and Testing, May 22, 1988.

USGS, Topographic Map, Bison Mountain, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

KIMBALL  
PA NO. 39-018





Kimball PA# 39--018  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/18/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-018-WR-1	2350 J	66.6 J	5.6	3.91	4.47	32.2 J	39600 J	0.063 J	412 J	2.64 U	901 J	97.6	385 J	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL.		SULFUR		SULFATE		PYRITIC		SULFUR	
	SULFUR %	ACID BASE t/1000	ACID BASE t/1000	POTENT. t/1000	POTENT. t/1000	ACID BASE t/1000	SULFUR %	SULFUR %	SULFUR %	SULFUR %	PYRITIC SULFUR ACID BASE t/1000	PYRITIC SULFUR ACID BASE t/1000	ACID BASE POTENT. t/1000	
39-018-WR-1	3.07	95.9	43.4	-52.	0.65	2.09	0.33							-21.9

LEGEND

WR1 - Composite of subsamples WR1, 2A, 2B, and 3.  
BACKGROUND - From Charter Oak Mine (39-003-SS-1).



**XRF ANALYSIS RESULTS**

**KIMBALL  
PA NO. 39-018**





Kimball PA# 39-018  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-018-WR2-A		38343.9	23244.7	2382.14		1430.68	21524.7	229.774 *	48.1743 *	349.852	3565.87	122.571
39-018-WR2-B		28653	31049.9	2105.7		370.362 *	41866.9	370.808 *	68.8177 *	213.375	5851.66	189.508
39-018-WR-1		13526.1	6283.62	2631.51		817.622 *	105696		139.749 *	259.243	217.91	102.173
39-018-WR-1-COMP		19730.2	20570.1	1520.41		979.07 *	39171.7			354.751	2270.25	217.794
39-018-WR-3		24666.6	36053.1	1439.15		892.877 *	49379.1		85.5686 *	1473.95	191.586	431.054
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-018-WR2-A	195.982			113.669	199.097		69.5175 *	486.64	109.993 *	15.8056 *		
39-018-WR2-B	186.38			776.508	187.7		361.821	965.76		12.1553 *	11.399 *	
39-018-WR-1	218.54				120.232			616.993		14.7324 *	7.31244 *	
39-018-WR-1-COMP	181.625			210.22	137.94		95.4324 *	619.93	96.787 *		6.42429 *	
39-018-WR-3	199.616			36.4825 *	126.992			987.561			13.4634 *	

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

KIMBALL  
PA NO. 39-018





# **AIMSS SCORESHEET**

SITE NAME:

KIMBALL

PA NUMBER:

39-018

LINE NO.		GROUNDWATER PATHWAY	PA NUMBER:	39-018	
1		OBSERVED RELEASE		0	
2		EXCEEDENCES		0	
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20	
3B		GW DEPTH		10	
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200	
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200	
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.459	
6	GW - TARGETS	WELLS - 1 MI. x 2.5		7.5	
7		WELLS - 1 TO 4 MI		20	
8		NEAREST WELL		5	
9		TARGETS SCORE	LINES 6 + 7 + 8	32.5	
10		GROUNDWATER SCORE		LINES 4 x 5 x 9	61484
		SURFACE WATER PATHWAY			
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0	
12		EXCEEDENCES		0	
13A		CONTAINMENT		20	
13B		DISTANCE TO SW		2	
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40	
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40	
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.738	
16	SW - TARGETS	DRINKING WATER POP'N		0	
17		IMPACTED DRAINAGE		0	
18		WETLANDS		10	
19		FISHERY		5	
20		RECREATION		5	
21		IRRIGATION/STOCK		2	
22		T & E SPECIES HABITAT		5	
23		TARGETS SCORE	SUM LINES 16 THRU 22	27	
24		SURFACE WATER SCORE		LINES 14 x 15 x 23	10517
		AIR PATHWAY			
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0	
26A		CONTAINMENT		10	
26B		DISTANCE TO POPULATION		10	
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100	
27		LIKELIHOOD SCORE	LINES 25 + 26C	100	
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.325	
29	AIR - TARGETS	POPULATION - 4 MILES		10	
30		NEAREST RESIDENCE		5	
31		WETLANDS		10	
32		PARKS / WILDERNESS		0	
33		T & E SPECIES HABITAT		5	
34		TARGETS SCORE	SUM LINES 29 THRU 33	30	
35		AIR PATHWAY SCORE		LINES 27 x 28 x 34	975
		DIRECT CONTACT PATHWAY			
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50	
37A		ACCESSIBILITY		20	
37B		DISTANCE TO POPULATION		10	
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200	
38		LIKELIHOOD SCORE	LINES 36 + 37C	250	
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.315	
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1	
41		NEAREST RESIDENCE		5	
42		RECREATIONAL USE		5	
43		TARGETS SCORE	SUM LINES 40 THRU 42	11	
44	DIRECT CONTACT SCORE		LINES 38 x 39 x 43	866	
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			0.74	

SITE NAME:  
PA NUMBER:

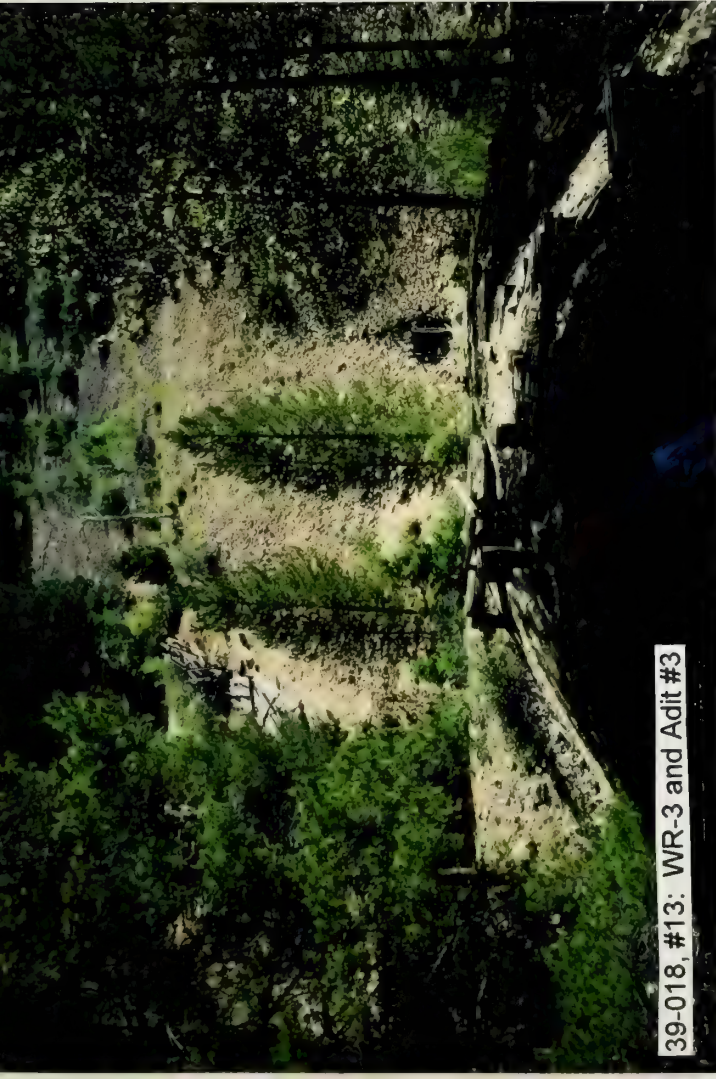
KIMBALL  
39-018

LINE  
NO.

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	40
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	11
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>8.80</b>





39-018, #13: WR-3 and Adit #3



39-018, #14: Adit #2



39-018, #15: WR-2 and loadout



39-018, #16: WR-1 and culvert closure at Adit #1







MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: SURE THING PA#: 39-020

Date: June 28, 1993 Time: 0935

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer  
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; thunder shower  
while completing the sampling.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #12: GW-1 at Adit  
#1; #13: WR-2 and Shaft #1; #14: WR-2. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms):  
Note elevated radiation readings at WR-2.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Grade, lime,  
and revegetate dump; may want to cap WR-2 or replace in hole due to  
high radiation reading in material. Study water treatment  
requirements and alternatives comprehensively with seeps below the  
mine area.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): SURE THING PA#: 39-020

Legal Description: T 8N ; R 6W ; Sec. 15 , NW 1/4 SE 1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 26' 23" Longitude: W 112° 19' 55"

Primary Drainage Basin and Code: Telegraph Creek/17010201

Secondary Drainage Basin: O'Keefe Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Lead, Zinc

Activity Status: Active     , Inactive/Exploration     , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public

Owner, Agent, or Contact (Include address and phone when available): Bob Newman,  
Montana Gold Ventures, Inc., 2803 Duncan Drive, Missoula, MT  
59802. (406) 549-6785; Helena National Forest.

Relationship to other mines/sites in the area/district: Veins in  
the area exhibit the same mineralogy, and ore of similar deposit  
type.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 7200' , Slope 10°-20° ,  
Aspect Northern

Land use: Mining     , Recreational X , Residential     , Urban     ,  
Agricultural     , Other (Specify)    

Area of disturbed/unvegetated lands? 1 acres.  
Dimensions:    

Predominant vegetation types: Lodgepole pine, spruce, grouse  
whortleberry

Access: roads - good     , poor     , 4wd X , trail     .  
Other logistical considerations (proximity to other sites). Near  
Lily/Orphan Boy and Annie R./Hattie M. sites



Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on the northeast side of  
O'Keefe Mountain. Water draining off the site drains northeast  
into the Sure Thing swamps and could potentially reach O'Keefe  
Creek, which drains northwest away from the site. Site is  
underlain by quartz monzonite. Waste rock dump #2 has elevated  
radiation readings (0.15 to 0.703 mR/HR).

Mining/milling history, ore type/tenor, host rock, gangue: Two  
periods of production were recorded - 1902 to 1904 and 1935 to  
1947. From 1902 to 1947 inclusive, 2,372 tons were mined,  
producing 1,528 oz. Au, 65,116 oz. Ag, and 4,400 lbs. Pb. The year  
of highest production was in 1902. Host rock is argillized quartz  
monzonite cut by an apalite dike. Gangue minerals are quartz and  
tourmaline. Mineralization on the dumps included pyrite.

Mine Operation?

Shafts - Yes X, No    , # 1, Comment Caved

Adits - Yes X, No    , # 1, Comment Caved

Pits - Yes    , No X, #    , Comment    

Placers - Yes    , No X, #    , Comment    

Other - Yes    , No X, #    , Comment    

Mill Operation? Yes    , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill     Dedicated Mill    ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting?  
N/A

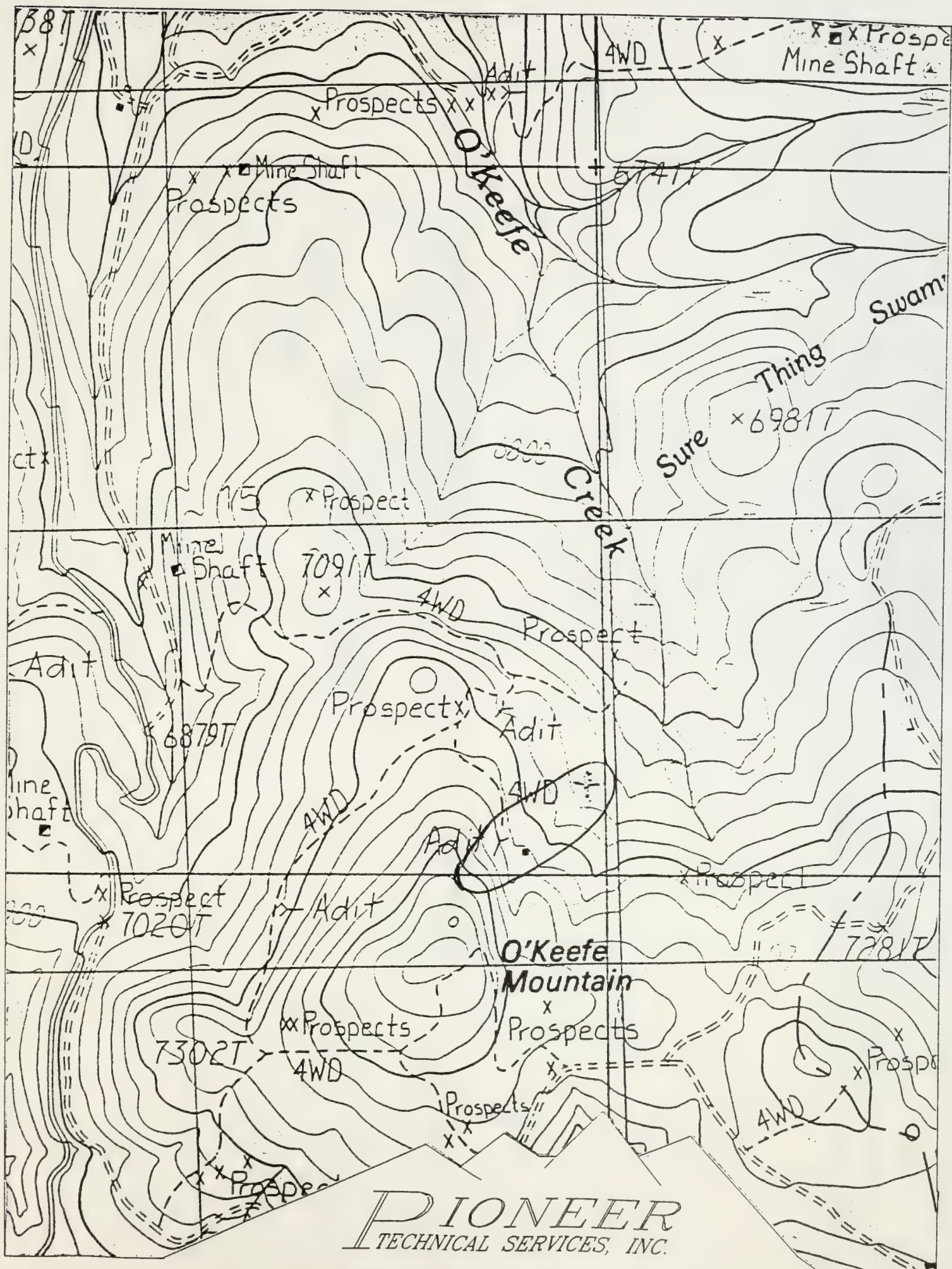


Montana Bureau of Mines and Geology  
Water Well Log Data

10/22/1993

No.	Location	Depth	Yield	Static Water Level
4:57348	08N 06W 16 AAC	50.0	15.0	0.00





**PIONEER**  
TECHNICAL SERVICES, INC.

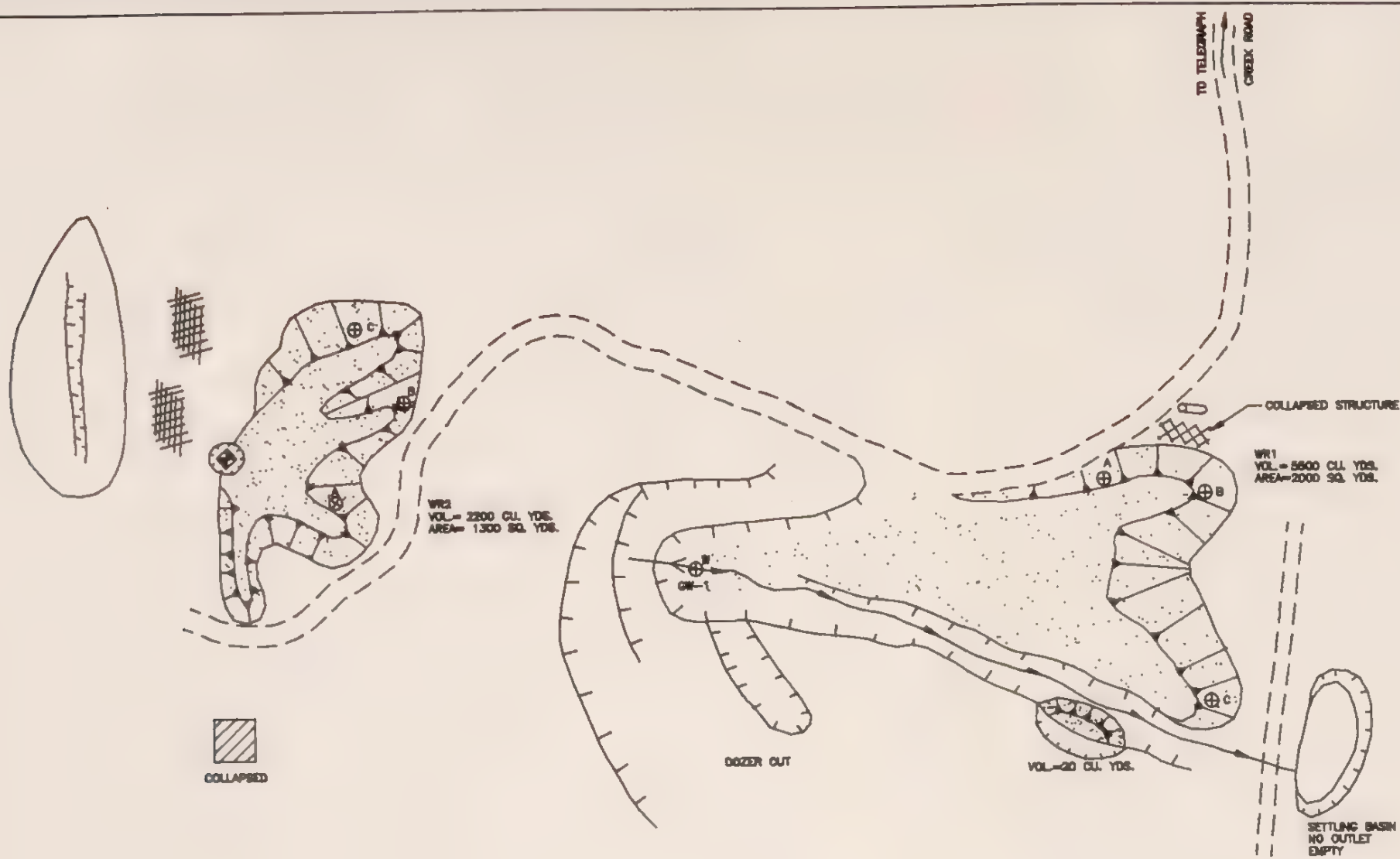
SURE THING, P.A. NO. 39-020

T08N, R06W, SECTION 15

SCALE: 1" = 1000'







APPROXIMATELY 2.5 ACRES  
OF DISTURBED GROUND.  
MULTIPLE SEEPS AND SMALL  
STREAMS. NO LABORATORY SAMPLES  
TAKEN (AREA NOT INCLUDED  
UNDER THE SURE THING PATENT)



NOT TO SCALE

# LEGEND

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
==	CULVERT	—Y—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—X—	COLLAPSED ADIT
○	UTILITY POLE	—□—	OPEN SHAFT
●	DECIDUOUS TREE	—■—	COLLAPSED SHAFT
*	CONIFEROUS TREE	—○—	EXCAVATION
— — —	WOOD FENCE	—●—	WASTE ROCK DUMP
— — —	WIRE FENCE	—X—X—	COLLAPSED TIMBERS
— — —	BUILDING	— — —	RAILS
○	BARRIER POST	—●—	SOIL SAMPLE
∧	GATE	—⊕—	XRF SAMPLE
— — —	EDGE OF ASPHALT	—⊕—	WATER SAMPLE
— — —	EDGE OF GRAVEL	—⊕—	GROUND AND SURFACE
▲	SLOPE DIRECTION	— — —	DRAINAGE
— — —	TAILINGS POND	—●—	WATER WELL
		— — —	PONDED WATER
		— — —	VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

SURE THING PA# 39-020  
ELLISTON DISTRICT POWELL COUNTY

SHEET NO.

**PIONEER**  
ENGINEERING & CONSULTANTS

**TDSH**

DRAWN JTP DATE 18 NOV 93  
DESIGNED TCR JOB NO. 93-17  
APPROVED WJB F.B. NO.

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





**SAMPLERS:** Bullock, Flammang

D-Direct reading (Railway Master); B-Saturated Paste (Orion Master)

--

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 1 Identification: Adit #1

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes    , No X, Number:     Identification:    

Groundwater wells within 4 miles?: Yes X, No    ;  
Number of well logs: 24

Distance to nearest well used for drinking? Approx. 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable X, Possible    , Unlikely    .

Adit discharge has low pH and associated rock is mineralized.

Other observations/notes: Disturbed area approx. 200 feet north of  
the mine contributes to problems in the drainage (see Surface Water  
observations).



**SAMPLERS:** Bullock

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

**Comments or Deviations from the SOPs (Pioneer SAP, 1993):**

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Dry streambeds: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Other surface water: Yes X, No\_\_\_\_, Name(s)/Description:\_\_\_\_\_  
Seeps/Springs below mine flow into wetlands.

Waste materials within any floodplain: Yes\_\_\_\_, No X Source ID(s):\_\_\_\_\_

Approximate Flood frequency?\_\_\_\_1 yr,\_\_\_\_10 yr,\_\_\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A  
High Flow:\_\_\_\_\_, Average Flow:\_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)?\_\_\_\_  
0 feet; Adit discharge (GW-1) flows through portions of WR-1.

Surface water draining onto or through waste sources: Yes X, No\_\_\_\_,  
Describe: Adit discharge (GW-1) flows through portions of WR-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Possible residential use, irrigation, stock watering, wetlands, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes X, No\_\_\_\_, Distance downstream (ft)? N/A Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):\_\_\_\_\_  
Adit discharge has caused minor erosion of WR-1, but flows into a settling/infiltration basin.



**SAMPLERS:** Flammang

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Parameters only - not part of the Sure Thing site.

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 1 acre at a reasonable slope

Wetlands present: Yes X, No   , Describe: Approx. 750 feet below site

Carbonate rocks/soils: Yes   , No X, Describe:   

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30   ; 30-100   ; 100-300   ; 300-1,000   ; 1,000-3,000   ; 3,000-10,000   ; 10,000 or greater   ; Comments   

Nearest residence(ft or miles)? Approx. 1 mile to recreational cabin

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS:** Bullock, Flammang

[illegible]

## Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Beer  
cans; shell casings

Accessibility - Fences, warning signs, closed roads? Unrestricted;  
accessible with a 4WD vehicle.

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment _____
Wilderness Area -	Yes____, No <u>X</u> , Comment _____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment _____
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium____, Low <u>Not Rated</u>
Wetlands Frontage -	High____, Medium____, Low <u>Not Rated</u>
Fisheries Habitat and Species Classification -	<u>1</u>
Sport Fishery Classification -	<u>4</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 1,  
types and locations: Collapsed adit highwall is approx. 20 feet high.  
\_\_\_\_\_  
\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 1, types and locations: WR-1 has steep unvegetated slopes, but  
is not very long.  
\_\_\_\_\_  
\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB, Environmental Assessment Analytical Data for Sure Thing, Prepared by MSE, Inc., October 4, October 29, November 7, and November 15, 1990.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Sure Thing, Prepared by Daphne Digrindakis, September 2, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Sure Thing, Prepared by Northern Engineering and Testing, June 7, 1988.

USBM, Metallic Mineral Deposits of Powell County, Bulletin 98, Written by H.G. McClernan, April 1976.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

SURE THING  
PA NO. 39-020





SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-020-WR-1	2810	9.6	0.6 U	1.3 U	1.7	54.8	12000	0.149 J	16.5	2 U	3850	42 J	43	NR
39-020-WR-2	4460	11.7	0.5 U	57.3	1 U	129	123000	0.285 J	6.8	57	24000	35 J	166	NR
39-020-WR-3	4930	22.9	0.5 U	3.1	4.9	248	54100	0.18 J	151	3	1620	13 J	556	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t
39-020-WR-1	0.47	14.7	-0.8	-15	0.18	0.13	4.06	-4.82
39-020-WR-2	17.7	554	-4.5	-558	7.72	7.92	247	-252
39-020-WR-3	1.54	48.1	-7.4	-56	0.25	0.05	1.56	-8.97

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
39-020-GW-1	1740	4.57	101 J	61.2 JX	7.8	1360	29400	0.038 U	12800	52.7	183	25.5	11000	114

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

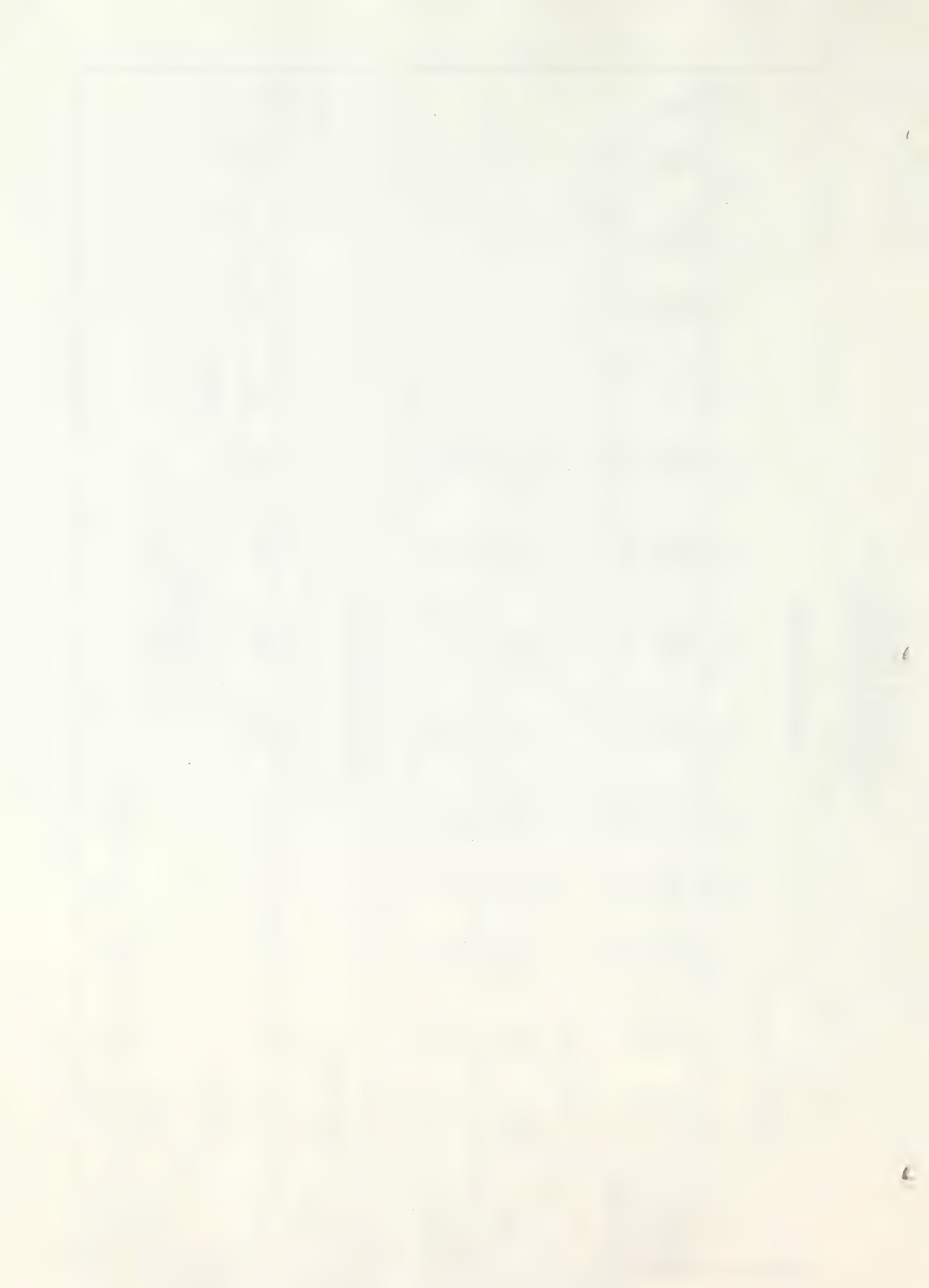
Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-020-GW-1	490	< 5.0	286	< 0.05	NR

LEGEND

- WR1 - Composite of subsamples WR1A, 1B, and 1C.
- WR2 - Sample of the WR2A subsample.
- WR3 - Composite of the subsamples WR2B and 2C.
- BACKGROUND - From the Ontario Millsite (39-010-SS-1).

GW1 - Discharge from adit #1.



**XRF ANALYSIS RESULTS**

**SURE THING  
PA NO. 39-020**





\* - Estimated Quantity  
\$ - Unvalidated Data

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

SURE THING  
PA NO. 39-020





# AIMSS SCORESHEET

SITE NAME:

SURE THING

PA NUMBER:

39-020

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	23
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18	SW - TARGETS	WETLANDS	10
19		FISHERY	20
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 THRU 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	1
30	AIR - TARGETS	NEAREST RESIDENCE	0
31		WETLANDS	0
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 THRU 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	1
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	5
43		TARGETS SCORE	SUM LINES 40 THRU 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		
	(LINES 10 + 24 + 35 + 44) / 100,000		10.59

LINE NO.				SITE NAME:	SURE THING
				PA NUMBER:	39-020
	<b>SITE SAFETY</b>				
1	THREAT	ACCESSIBILITY			20
2		OPEN SHAFTS	100 EA.		0
3		OPEN ADITS	50 EA.		0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		75
5		HAZ. STRUCTURES	40 EA.		0
6		EXPLOSIVES			0
7		HAZ. MATERIALS			0
8		HAZARDS SCORE	SUM LINES 2 THRU 7		75
9		POPULATION - 1 MILE			1
10	TARGETS	NEAREST RESIDENCE			0
11		RECREATIONAL USE			5
12		TARGETS SCORE	SUM LINES 9 THRU 11		6
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>		<b>9.00</b>

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

TABLE 1.1

## COMPARISON OF SURE THING MINE WASTES WITH AVERAGE ROCK AND SOIL VALUES

	Sure Thing Lower Dump mg/kg	Lower Sure Thing Waste Dump mg/kg	Granite <sup>a</sup> mg/kg	Soils <sup>b</sup> of Western U.S. Normal Values mg/kg	Soils <sup>b</sup> of Western U.S. Extreme <sup>c</sup> Values mg/kg
As	4170	437	1.5	5.5	21.6
Cd	<1	3.19	0.2	0.2	1.3
Cu	50	69	10	21	90
Fe	9840	22,800		21,000	79,800
Pb	3600	225	20	17	55
Zn	15	317	40	55	176
pH	2.40	5.48			

a Levinson, 1984

b Shacklette & Boerngen, 1984

c Extreme Value = mean + 2 standard deviations



TABLE 1.2

## COMPARISON OF WATER FROM THE SURE THING MINE TO STATE AND EPA STANDARDS

	Water From Sure Thing	Water Downstream of Sure	Cold Water Aqueous <sup>b</sup>	Drinking Water <sup>b</sup> mg/l	Irrigation <sup>b</sup> mg/l	Livestock <sup>b</sup> mb/l	EPA Standards from Operating Cu, Pb, Zn, Ag, Au Mines <sup>c</sup>
							Max.1 day    Ave.30 days
As	8.38	<0.1	0.44	0.3	0.10	0.20	
Cd	0.0524	0.059	0.003	0.01	0.05	0.05	
Cu	1.15	0.59	0.012	1.0	5.0	0.5	.30    .15
Fe	210	0.07	1.0	0.3	20.0		
Pb	0.344	<0.07	0.004	0.05	10.0	0.10	.60    .30
Zn	8.62	4.97	0.037	5.0	10.0	25.0	1.50    .75
pH	2.86	5.81?	6.5-8.5	6.5-8.5	4.5-9.0		

a Total Extractable Metals

b MDHES, 1984?

c EPA 40CFR 440.102

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Sure Thing Adit Discharge

LAB NO: W8574

DATE RECEIVED: 09-14-90

Hardness 84 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 8.38 mg/L

Cd 0.0524 mg/L

Cu 1.15 mg/L

Fe 210 mg/L

Pb 0.344 mg/L

Zn 8.62 mg/L

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Sure Thing Dump--08/23/90

LAB NO: S2687

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.40 SU

Total Metals

As 4170 mg/Kg

Cd <1 mg/Kg

Cu 50 mg/Kg

Fe 9840 mg/Kg

Pb 3600 mg/Kg

Zn 15 mg/Kg

DATE: November 7, 1990

CLIENT: Abandoned Mines

FIELD ID: Lower Surething Waste Dump

LAB NO: S2776

DATE RECEIVED: 10/18/90

pH (1:1 slurry) 5.48 SU

Total Metals

As 437 mg/Kg

Cd 3.19 mg/Kg

Cu 69 mg/Kg

Fe 22,800 mg/Kg

Pb 225 mg/Kg

Zn 317 mg/Kg



DATE: November 15, 1990

CLIENT: Abandoned Mines

FIELD ID: Lower Surething Stream Below Disturbance

LAB NO: W8864

DATE RECEIVED: 10/18/90

Hardness 176 mg/L as  $\text{CaCO}_3$

Total Metals

As <0.1 mg/L

Cd 0.059 mg/L

Cu 0.59 mg/L

Fe 0.07 mg/L

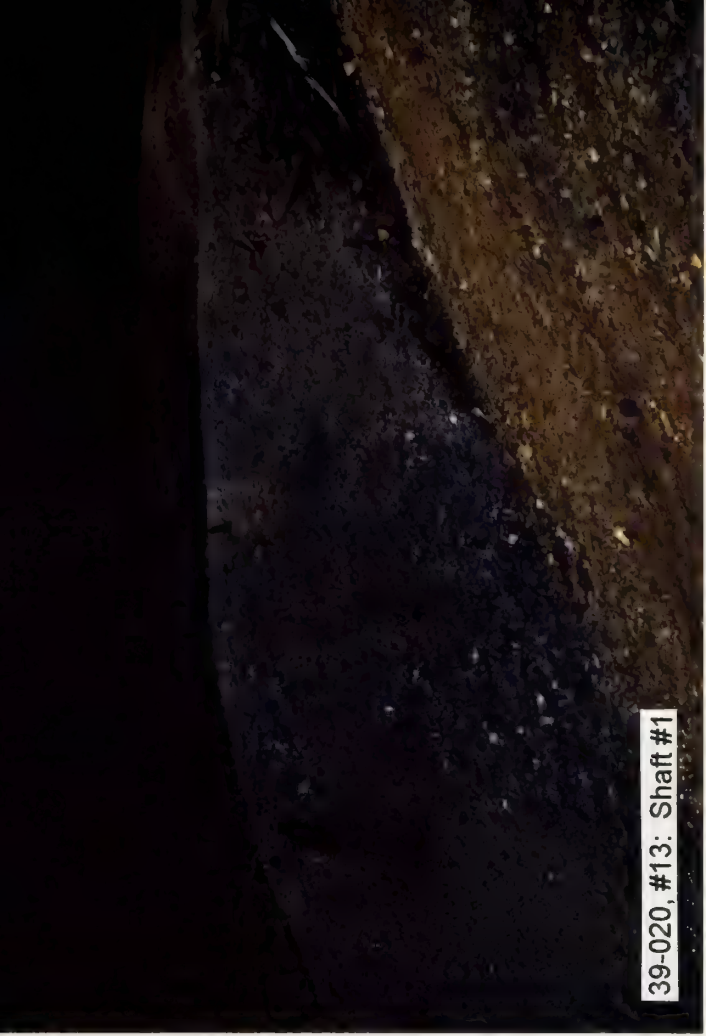
Pb <0.07 mg/L

Zn 4.97 mg/L





39-020, #12: GW-1 sample location



39-020, #13: Shaft #1



39-020, #14: WR-2





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: JULIA PA#: 39-022

Date: June 28, 1993 Time: 1545

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Cool (Approx. 50°F); rainy;  
slight breeze (5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #33: Shaft at WR-1;  
#34: WR-3; #35: WR-2; #36: Adit below WR-1. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: It may be  
possible to reprocess for lead and other metals.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): JULIA PA#: 39-022

Legal Description: T 8N ; R 6W ; Sec. 5 , S 1/2SW 1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 28' 00" Longitude: W 112° 22' 35"

Primary Drainage Basin and Code: Telegraph Creek/17010201

Secondary Drainage Basin: Booth Gulch

USGS Quadrangle map name(s): Bison Mountain/Three Brothers

Mine Type/Commodities: Hardrock/Copper, Lead, Gold, Silver

Activity Status: Active     , Inactive/Exploration     , Abandoned X .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Helena National Forest.

Relationship to other mines/sites in the area/district: Many  
mines in district

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Some adit and shaft closures.

General site features: Elevation 6700' , Slope 30° ,  
Aspect East

Land use: Mining     , Recreational X , Residential     , Urban     ,  
Agricultural     , Other(Specify)    

Area of disturbed/unvegetated lands? 0.5 acres.  
Dimensions:    

Predominant vegetation types: Lodgepole pine and spruce forest

Access: roads - good     , poor     , 4wd X , trail     .  
Other logistical considerations (proximity to other sites). Road  
is closed; must walk to site.



Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 3 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on a knob between two  
tributaries to Booth Gulch. Booth Gulch flows northwest into  
Telegraph Creek about 1 1/2 miles below the site. The site is  
underlain by quartz monzonite and mineralization occurs as veins  
in the quartz monzonite.

Mining/milling history, ore type/tenor, host rock, gangue:  
History is from 1890 to unknown. Mineralization occurs in veins  
cutting across the host rock, quartz monzonite. Mineralization  
occurs as pyrite, sphalerite, galena, tetrahedrite and sulfosalts  
in a quartz tourmaline gangue. Reported as 60 oz. Ag/ton.

Mine Operation?

Shafts - Yes X, No    , # 1, Comment Covered, 200 feet deep  
Adits - Yes X, No    , # 2, Comment 1 open; 1 culvert closure  
Pits - Yes    , No X, #    , Comment      
Placers - Yes    , No X, #    , Comment      
Other - Yes    , No X, #    , Comment    

Mill Operation? Yes    , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill     Dedicated Mill    ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

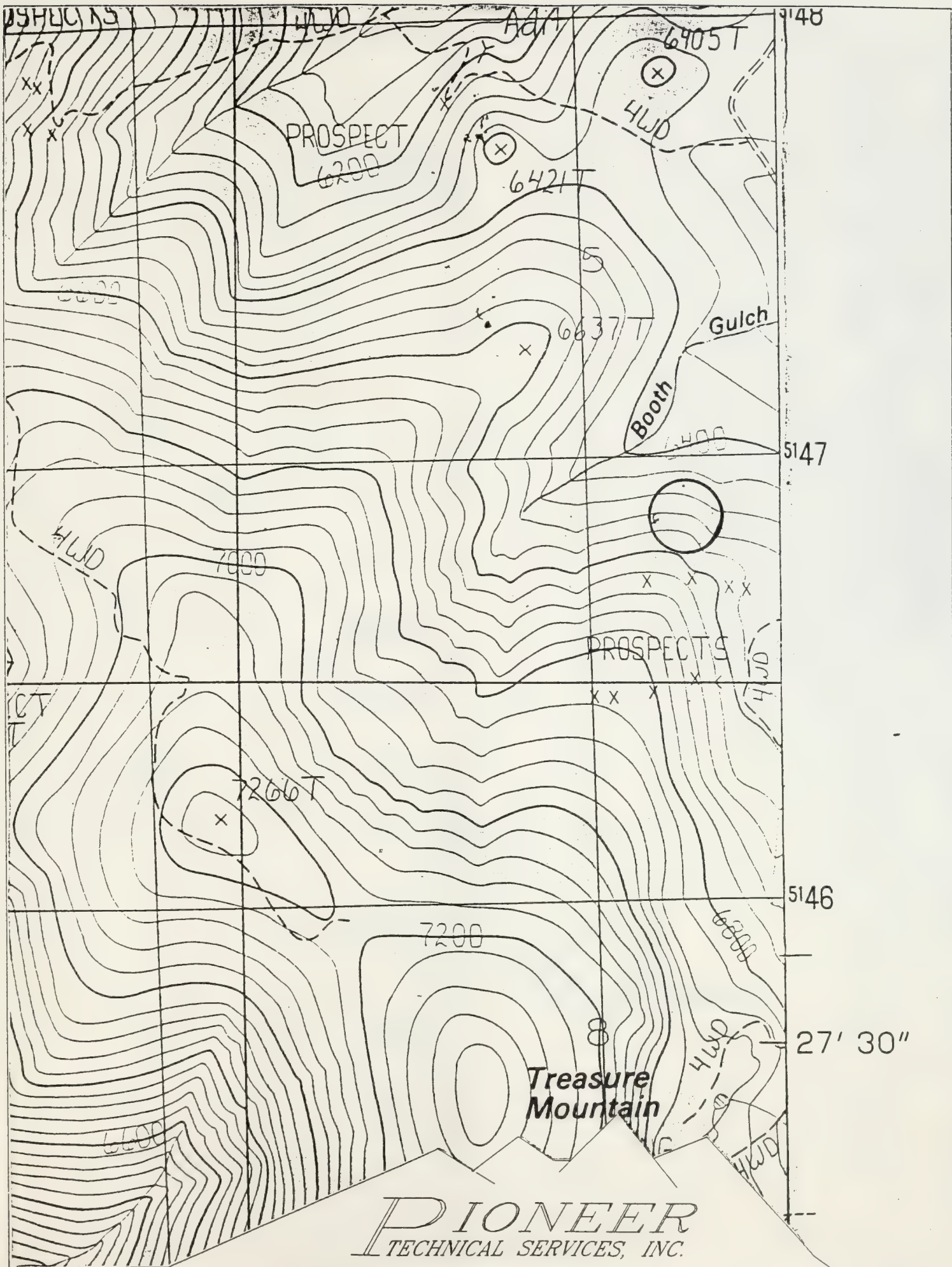


Montana Bureau of Mines and Geology  
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
M:5473	08N 06W 05 AA	0.0	0.0	0.00
M:59206	09N 06W 32 AA	105.0	10.0	18.00
M:59207	09N 06W 32 ACDA	31.0	8.0	3.00





**PIONEER**  
TECHNICAL SERVICES, INC.

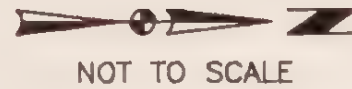
JULIA, P.A. NO. 39-022

T08N, R06W, SECTION 05

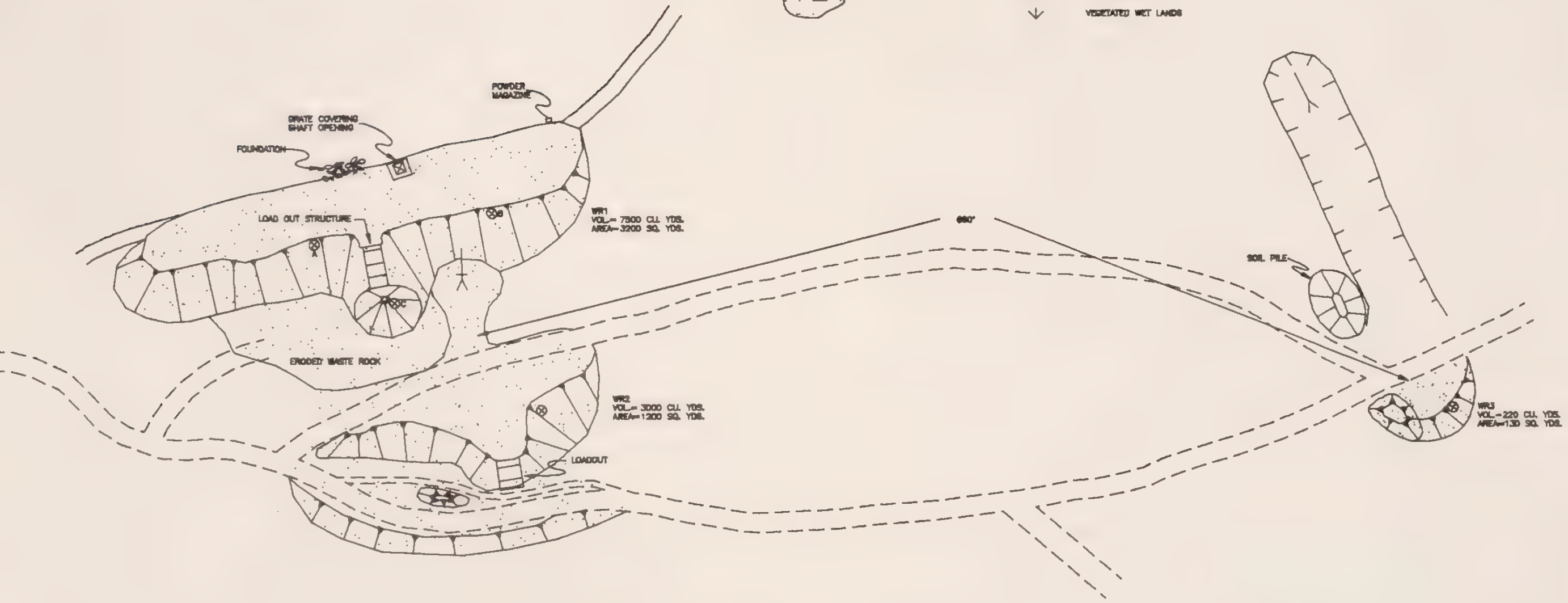
SCALE: 1" = 1000'







SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
*	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
○	UTILITY POLE	□	OPEN SHAFT
●	DECIDUOUS TREE	□	COLLAPSED SHAFT
●	CONIFEROUS TREE	○	EXCAVATION
—	WOOD FENCE	○	WASTE ROCK DUMP
—	WIRE FENCE	×	COLLAPSED TIMBERS
▨	BUILDING	—	RAILS
○	BARRIER POST	⊕	SOIL SAMPLE
∧	GATE	⊕	XRF SAMPLE
- - -	EDGE OF ASPHALT	⊕	WATER SAMPLE
- - -	EDGE OF GRAVEL	⊕	GROUND AND SURFACE
▲	SLOPE DIRECTION	—	DRAINAGE
○	TAILINGS POND	●	WATER WELL
		—	PONDED WATER
		—	VEGETATED WET LANDS



DRAWN: JTP DATE: 17 NOV 93  
DESIGNED: TPR JOB NO. 39-022  
APPROVED: WJB F.B. NO.

**PIONEER**  
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA  
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

JULIA PA# 39-022  
ELLISTON DISTRICT POWELL COUNTY

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





**SAMPLERS:** Babits, Pierson, Lasher

[illegible]

D-Direct reading (Kelway Meter), S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 39-022-WR-1 is composite of WR-1A through -1C, and WR-3.  
39-022-WR-2 is WR-2.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes X, No\_\_\_, Number: 1 Identification: Base of WR-2;  
impossible to sample (too disperse)

Groundwater wells within 4 miles?: Yes X, No\_\_\_;  
Number of well logs: 34

Distance to nearest well used for drinking? 2 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible X, Unlikely\_\_\_.

Uncontained sources containing elevated metal values; seep in area  
indicates shallow groundwater and sources may be in contact.

Other observations/notes: N/A



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Dry streambeds: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Other surface water: Yes X, No\_\_\_\_, Name(s)/Description: Seeps;  
very disperse

Waste materials within any floodplain: Yes\_\_\_\_, No X Source ID(s):\_\_\_\_\_

Approximate Flood frequency?\_\_\_\_1 yr,\_\_\_\_10 yr,\_\_\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A  
High Flow:\_\_\_\_\_, Average Flow:\_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)?\_\_\_\_  
Approx. 0.5 mile drainage between WR-2 and Booth Gulch, and Booth  
Gulch has seep water.

Surface water draining onto or through waste sources: Yes X, No\_\_\_\_,  
Describe: Seep adjacent to WR-2

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Fishery, irrigation, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_,  
No X, Distance downstream (ft)?\_\_\_\_\_ Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present): \_\_\_\_\_  
Booth Gulch is far from site.



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes ☐, No ☒, Describe: \_\_\_\_\_

Carbonate rocks/soils: Yes , No ☒ , Describe:

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30\_\_\_; 30-100 X;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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**SAMPLERS:** Babits, Pierson, Lasher

[illegible]

## Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Skeet

Accessibility - Fences, warning signs, closed roads? Closed roads,  
must walk approx. 3/4 mile

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes <u>X</u> , No____, Comment <u>Adit</u>

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium____, Low <u>Not Rated</u>
Wetlands Frontage -	High____, Medium____, Low <u>Not Rated</u>
Fisheries Habitat and Species Classification -	<u>1</u>
Sport Fishery Classification -	<u>4</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Adit at WR-3

Hazardous structures: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Loadouts

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 3, types and locations: All piles are sloughing.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



## Bibliography

- Lytzen, W.W., Preliminary Report on the Julia Group of Claims, Comprising the Julia, Alloues, Osceola, Grey Copper, and Ameek Claims in the Elliston Mining District (Unauthorized), Powell County, Montana, October 5, 1909.
- MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976, pp. 7-17.
- MBMG, Mineral and Industry File 90.0, Julia Mine, Powell County, Montana.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet, Prepared by Daphne Digrindakis, August 31, 1982.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Julia, Prepared by Northern Engineering and Testing, June 13, 1988.
- USGS, Topographic Map, Bison Mountain and Three Brothers, 7 1/2 minute Quadrangles, 1985.



LABORATORY ANALYTICAL DATA

JULIA  
PA NO. 39-022





# SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-022-WR-1	106	17.8	3.9	2.3	1.2	108	25000	1.37 J	67.2	2 U	2030	382 J	458	NR
39-022-WR-2	136	5.8	291	8.6	1.1 U	155	90500	5.12 J	16.7	4	10500	602 J	27600	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

## Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR ACID BASE		SULFUR ACID BASE POTENT.	
	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000
39-022-WR-1	1.77	55.3	-1.9	-57.	1.24	-57.	0.12	3.75	0.41	3.75	0.12	3.75	-5.66	-5.66
39-022-WR-2	17.2	537	-3.5	-540	<0.01	-540	6.96	217	10.9	217	6.96	217	-221	-221

## LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, and 3.  
WR2 - Sample from the WR2 subsample.  
BACKGROUND - From Charter Oak Mine (39-003-SS-1).



XRF ANALYSIS RESULTS

JULIA  
PA NO. 39-022





## XRF Field Analyses

## Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-022-WR1-A		26974.9	11043				23218.5		326.856	1643.62		50.4326
39-022-WR1-B		16315.8	10724.9				34134.8		181.629 *	1674.84		86.5759
39-022-WR1-C		22001.7	34010.2				38274			74.1215 *		64.3762
39-022-WR2-A		14573.2	11706.6				30040.8		239.666	16183.9		21.6791 *
39-022-WR3-A		20197.8	10331.1			620.748 *	56861		60.7371 *	145.372 *	241.932	126.023
39-022-WR-1-COMP		18679	13037.7				33131.4		169.828 *	1232.35		97.7528
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-022-WR1-A	159.321		5.57513 *	2855.88	213.672		2873.42	284.109	211.546 *		41.9459 *	
39-022-WR1-B	185.17			2014.87	164.241		1040.31	373.077	112.772 *		20.3363 *	
39-022-WR1-C	127.664			315.797	194.863			306.455			9.6264 *	
39-022-WR2-A	99.6052			8925.9	93.5261	305.524 *	4378.44	140.256	286.919 *		44.4573 *	
39-022-WR3-A	112.606		22.5205	234.111	166.946			275.849			12.6085 *	
39-022-WR-1-COMP	127.301		7.74852 *	1859.81	181.739		1353.32	296.972	112.741 *		26.9518 *	

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

JULIA  
PA NO. 39-022





# AIMSS SCORESHEET

SITE NAME:

JULIA

PA NUMBER:

39-022

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 41.298
6		WELLS - 1 MI. x 2.5	7.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	31
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 38.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 317995
		<b>SURFACE WATER PATHWAY</b>	
11		OBSERVED RELEASE	0
12		EXCEEDENCES	0
13A	SW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 45.401
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19	SW - TARGETS	FISHERY	20
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 THRU 22 37
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 67193
		<b>AIR PATHWAY</b>	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 50
27		LIKELIHOOD SCORE	LINES 25 + 26C 50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 1.513
29		POPULATION - 4 MILES	30
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	0
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 THRU 33 30
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 2270
		<b>DIRECT CONTACT PATHWAY</b>	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	5
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 25
38		LIKELIHOOD SCORE	LINES 36 + 37C 75
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 1.377
40	DIRECT CONTACT	POPULATION - 1 MILE	0
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	2
43		TARGETS SCORE	SUM LINES 40 THRU 42 2
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 207
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000		3.88

LINE NO.				SITE NAME: PA NUMBER:	JULIA 39-022
		<u>SITE SAFETY</u>			
1	THREAT	ACCESSIBILITY			5
2		OPEN SHAFTS	100 EA.		0
3		OPEN ADITS	50 EA.		50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		0
5		HAZ. STRUCTURES	40 EA.		80
6		EXPLOSIVES			0
7		HAZ. MATERIALS			0
8		HAZARDS SCORE	SUM LINES 2 THRU 7		130
9		POPULATION - 1 MILE			0
10	TARGETS	NEAREST RESIDENCE			0
11		RECREATIONAL USE			2
12		TARGETS SCORE	SUM LINES 9 THRU 11		2
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000		1.30





39-022, #33: WR-1 shaft



39-022, #34: WR-3



39-022, #35: WR-2



39-022, #36: Adit below WR-1





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: TELEGRAPH PA#: 39-023

Date: June 10, 1993 Time: 1145

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Approx. 50°F; scattered showers.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #7: SW-4 and Adit #1; #8: SW-3; #9: WR-1 and mill structure; #10: Mill structure; #11: Seep between WR-1 and -2; #12: Adit #2 and WR-2; #13: SW-2 sample location upgradient in Bryan Creek; #14: SW-1 downgradient Bryan Creek. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study treatment requirements and alternatives for adit discharge. Divert surface water from waste rock dumps; grade, amend, and revegetate.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): TELEGRAPH PA#: 39-023

Legal Description: T 8N ; R 6W ; Sec. 11 , NW1/4 NE1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 27' 51" Longitude: W 112° 18' 51"

Primary Drainage Basin and Code: Telegraph Creek/17010201

Secondary Drainage Basin: Bryan Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock, Placer/Gold, Silver

Activity Status: Active     , Inactive/Exploration     , Abandoned X .

Ownership status: Known Y X N ; private/public? Private/Public

Owner, Agent, or Contact (Include address and phone when available): James Williams,  
151 East Lacy, Hayden Lake, ID 83835; Helena National Forest.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 6760' , Slope 25° ,  
Aspect Southern

Land use: Mining     , Recreational X , Residential     , Urban     ,  
Agricultural     , Other(Specify)    

Area of disturbed/unvegetated lands? 0.5 acres.

Dimensions: 245 feet x 95 feet

Predominant vegetation types: Ponderosa pine, Douglas fir,  
Engleman spruce, pine grass, kinnikinick

Access: roads - good X , poor     , 4wd     , trail     .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies just above perennial Bryan Creek. The creek flows west past the site to a confluence with Sally Ann Creek one mile below the site, then to a confluence with Telegraph Creek one mile below that.

Mining/milling history, ore type/tenor, host rock, gangue: Production from 1927 to 1934 is recorded as 17 oz. Au, 339 oz. Ag, 24 lbs. Cu, and 994 lbs. Pb for 30 tons of ore. Adit may have been driven to explore for placer gold source. Placer piles contain cobbles of aplite and argillized quartz monzonite.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 2, Comment No openings  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

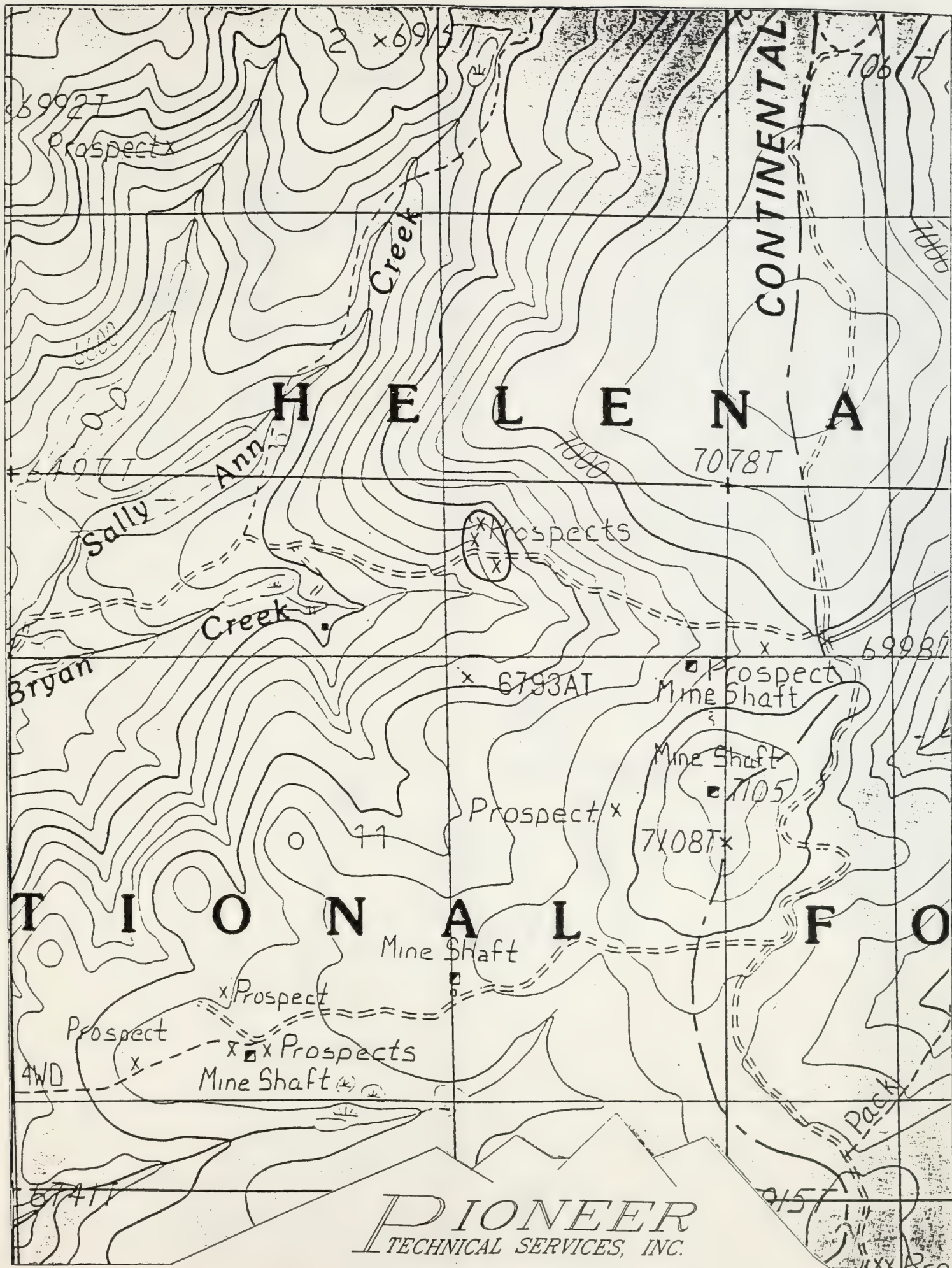
Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: No documentation on alleged stamp mill and no tailings were found, but structure appeared to be a possible small-scale mill; may be ore load out, but unlikely location/configuration.

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? N/A





**PIONEER**  
TECHNICAL SERVICES, INC.

TELEGRAPH, P.A. NO. 39-023

T08N, R06W, SECTION 11

SCALE: 1" = 1000'



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CULVERT		OPEN ADT
	LIGHT (LIGHT POLE)		COLLAPSED ADT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		DEBRIS
	WOOD FENCE		WHITE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBER
	BUILDING		RAIL
	BARBER POST		SOIL SAMPLE
	GATE		WTF SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE
	EDGE OF GRAVEL		GROUND AND SURFACE
	SLOPE DIRECTION		DRAINAGE
	TALUS POND		WATER WELL
			PONDED WATER
			VEGETATED WET LANDS



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
TELEGRAPH PA# 39-023  
ELLISTON DISTRICT POWELL COUNTY

**PIONEER**  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL-SPOKANE

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL-SPOKANE

DRAWN: JTP DATE: 17 NOV 83  
DESIGNED: TPR JOB NO.: 39-17  
APPROVED: MJB F.B. NO.:  
SHEET NO.:





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

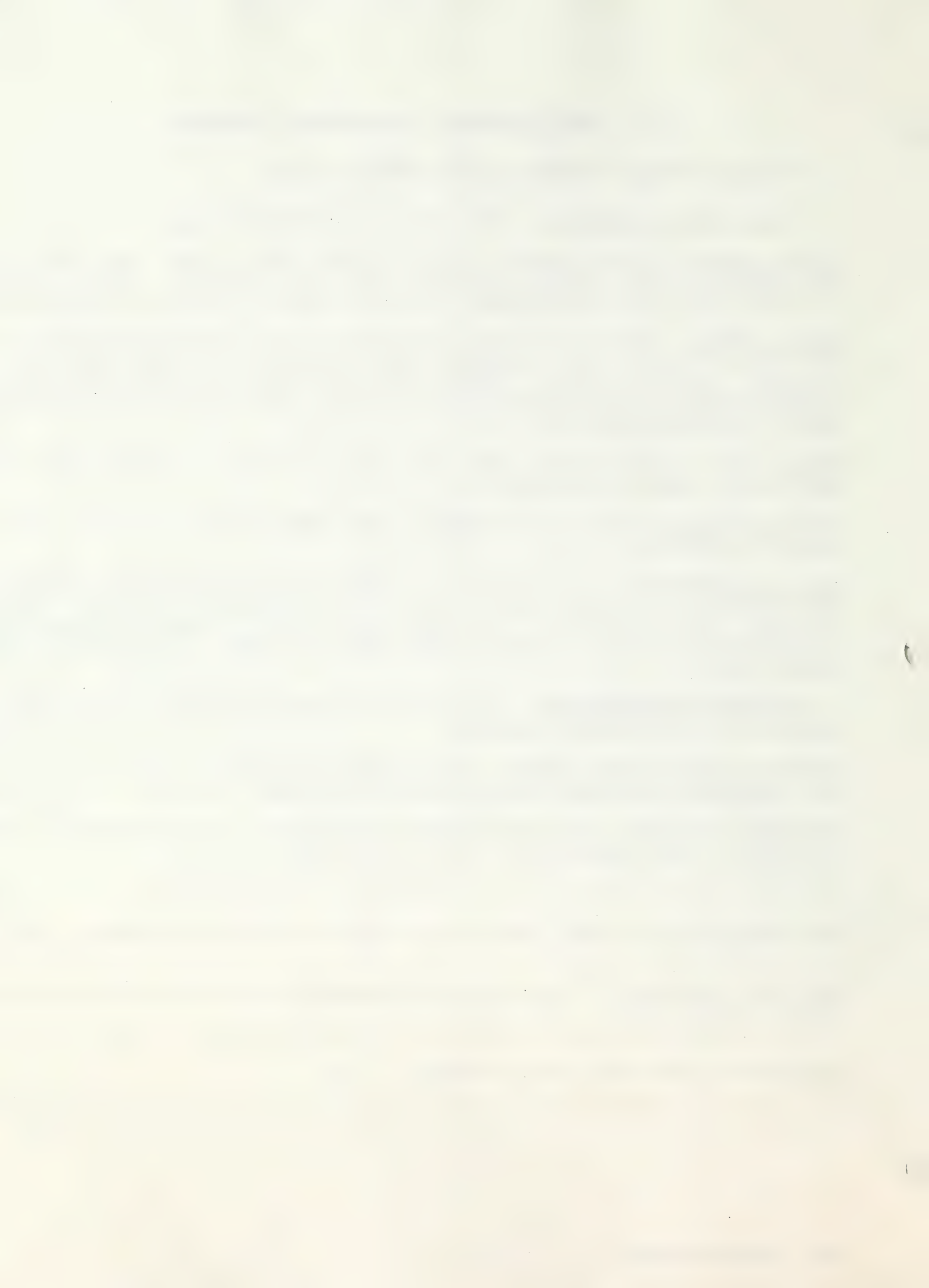
Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A - possible milling, but no tailings located.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



**SAMPLERS:** Bullock, Pierson

[illegible]

D-Direct reading (Selye Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 39-023-WR-1 is composite of WR-1A through -1C. 39-023-WR-2 is grab of WR-2. NM = Not Measured



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 2 Identification: Adit #1 and Adit #2

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes X, No     , Number: 1 Identification: Seep between WR-2 and WR-3

Groundwater wells within 4 miles?: Yes X, No     ;

Number of well logs: 41

Distance to nearest well used for drinking? Approx. 1.25 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable X, Possible     , Unlikely     .

Low pH, high SC groundwater discharging from Adit #1.

Other observations/notes: N/A



**SAMPLERS: Bullock, Pierson**

[illegible]

FLOW: Estimated (E) or Measured (M) from edit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): GW-1 and GW-2 were sampled as SW-5.  
 NM = Not Measured

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Adit discharges flowing into Bryan Creek

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-1 receives adit discharge, WR-2 within the 100 yr floodplain of Bryan Creek.

Approximate Flood frequency?      1 yr,      10 yr, X 100 yr

Estimated seasonal flow of stream(s) (cfs)?     

High Flow: Adit discharge - 20 gpm; Bryan Creek - 3 cfs

Average Flow: Adit discharge - 10 gpm; Bryan Creek - 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet from WR-1 to adit discharge; WR-2 is within 25 feet of Bryan Creek.

Surface water draining onto or through waste sources: Yes X, No     , Describe: Adit discharge #1 flows through and seep out of WR-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Fisheries, wetlands, irrigation probable

Observed erosional/sedimentation/stream turbidity problems? Yes X No     , Distance downstream (ft)? 50 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Partially bare and eroding stream bank for approx. 50' downstream of WR-1.



# SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Pierson

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu\text{S}/\text{cm}$ @ 25°C	Sh mV	Temp °C	ALK. mg/L as $\text{CaCO}_3$	Flow' cfs/gpm	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
SW-1	SW	Bryan Creek down stream from adit discharge confluence	6.40	59.3	173	6.4	4	0.47 cfs (M)	39-023-SW-1	06/10/93 1340	T Metals, TDS, Hardness, $\text{SO}_4$ , $\text{Cl}^-$ , $\text{NO}_2/\text{NO}_3$
SE-1	SE	Bryan Creek down stream from adit discharge confluence	N/A	N/A	N/A	N/A	N/A	N/A	39-023-SE-1	06/10/93 1340	T Metals
SW-2	SW	Bryan Creek upstream from adit discharge and possible influence from WR-2	7.56	60.8	162	6.9	10	0.29 cfs (M)	39-023-SW-2	06/10/93 1350	T Metals, TDS, Hardness, $\text{SO}_4$ , $\text{Cl}^-$ , $\text{NO}_2/\text{NO}_3$
SE-2	SE	Bryan Creek upstream from adit discharge and possible influence from WR-2	N/A	N/A	N/A	N/A	N/A	N/A	39-023-SE-2	06/10/93 1350	T Metals
SW-3	SW	Adit discharge below WR-1	3.77	92.6	219	6.4	0	0.05 cfs (M)	39-023-SW-3	06/10/93 1410	T Metals, TDS, Hardness, $\text{SO}_4$ , $\text{Cl}^-$ , $\text{NO}_2/\text{NO}_3$
SW-4	SW	Confluence of seeps in adit #1 area on the north side of the road	6.53	73.1	136	7.9	4	0.04 cfs (M)	39-023-SW-4	06/10/93 1420	T Metals, TDS, Hardness, $\text{SO}_4$ , $\text{Cl}^-$ , $\text{NO}_2/\text{NO}_3$
SE-500	SE	500 feet downgradient from SW-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000 feet downgradient from SW-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 3 acres of relatively level ground present below WR-1

Wetlands present: Yes X, No   , Describe: Approx. 40 acres of wetlands on Bryan Creek within 1 mile downstream of the mine

Carbonate rocks/soils: Yes   , No X, Describe:   

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10   ; 10-30 X; 30-100   ; 100-300   ; 300-1,000   ; 1,000-3,000   ; 3,000-10,000   ; 10,000 or greater   ; Comments   

Nearest residence(ft or miles)? Approx. 1.25 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed      high      moderate      low      none



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Pierson

[illegible]

## Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Signs  
of use by hunters in the area

Accessibility - Fences, warning signs, closed roads? Road temporarily  
closed by USFS due to erosion problems

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium____, Low <u>Not Rated</u>
Wetlands Frontage -	High____, Medium____, Low <u>Not Rated</u>
Fisheries Habitat and Species Classification -	<u>1</u>
Sport Fishery Classification -	<u>4</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Hazardous structures: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Old load out or mill structure, and cabin  
\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 1,  
types and locations: Unstable highwall behind collapsed Adit #1  
\_\_\_\_\_  
\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 1, types and locations: WR-1 is oversteepened and eroding  
into adit #1 discharge.  
\_\_\_\_\_  
\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Bibliography

- MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB, Environmental Assessment Analytical Data for Telegraph, Prepared by MSE, Inc., October 4 and 29, 1990.
- MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Telegraph, Prepared by Daphne Digirindakis, September 2, 1982.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Telegraph, Prepared by Northern Engineering and Testing, May 18, 1988.
- USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.







LABORATORY ANALYTICAL DATA

TELEGRAPH  
PA NO. 39-023



SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-023-SE-1	58 J	91.9	10.1	7.7	6.3	54.2	14300	0.217	2080	17 J	62	6 J	913	NR
39-023-SE-2	57 J	112	19.6	5.3	5.9	70.3	13000	0.131	3080	23 J	40	4 UJ	1840	NR
39-023-WR-1	208 J	48	0.4 UJ	1.3	4.3	48.9	25500	0.506	24.2	1 UJ	425	3 UJ	47	NR
39-023-WR-2	524 J	23.8	0.5 UJ	1.1 U	1.9	99.2	27500	0.147	24.1	2 UJ	58	8 J	133	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		SULFUR ACID BASE		SULFUR POTENT.		PYRITIC SULFUR		SULFUR ACID BASE		SULFUR POTENT.	
	%	t/1000	NEUTRAL POTENT.	t/1000	POTENT.	t/1000	%	t/1000	%	t/1000	%	t/1000
39-023-WR-1	0.35	10.9	-0.0	-0.0	-11	0.34	0.01	0	0.01	0	-0.05	-0.05
39-023-WR-2	0.44	13.7	-4.1	-4.1	-17.	0.43	0.01	0	0.01	0	-4.14	-4.14

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
39-023-SW-1	2.9	13.9	4.5	5.99 U	5 U	8.43	142	0.14	40.5	8.78 U	3.6	18.3 U	726	15.2
39-023-SW-2	1.49 U	14.4	4.07	5.99 U	5 U	4.57	107	0.1 J	62.2	8.78 U	2.39 J	18.3 U	1090	16.6
39-023-SW-3	2.84	16.3	2.55 U	5.99 U	5 U	34.2	166	0.11 J	103	8.78 U	6.17 J	18.3 U	76.8	13.3
39-023-SW-4	1.87	15.4	2.55 U	5.99 U	5 U	17.7	329	0.07 J	129	8.78 U	1.9 J	18.3 U	80.5	20

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-023-SW-1	55	< 5.0	19	0.07	NR
39-023-SW-2	54	< 5.0	18	0.06	NR
39-023-SW-3	69	< 5.0	28	< 0.05	NR
39-023-SW-4	72	< 5.0	26	< 0.05	NR

LEGEND

- SE1 - Bryan Creek downstream from adit discharge confluence.
- SE2 - Bryan Creek upstream from adit discharge and possible influence from waste rock dump 2.
- WR1 - Composite of subamples WR1A, 1B, and 1C.
- WR2 - Sample of the WR2 subample.
- BACKGROUND - From the Ontario Millsite (39-010-SS-1).
- SW1 - Same as sample SE1.
- SW2 - Same as sample SE2.
- SW3 - Adit discharge below waste rock dump 1.
- SW4 - Confluence of seeps in adit #1 area on the N. side of the road.





**XRF ANALYSIS RESULTS**

**TELEGRAPH  
PA NO. 39-023**



XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-023-SE-1000		7444.35	6165.11	1654.05		4711.02	54466.4		104.033 *	1603.5	64,0941 *	319,028
39-023-SE-500		10352.8	5087.06	795.455		2207.01	15943.4			597.735	42,2175 *	308,856
39-023-WR1-A		20616.1	3061.97	1813.87			46154.2			226.876	159,981 *	222,923
39-023-WR1-B		25466	3145.01	2124.88			30314.6			118.779 *		157,477
39-023-WR1-C		29375.6	1773.89	1530.21			21309.5			85.628 *	140,375 *	210.98
39-023-WR-1-COMP		27744.7	2609.58	1669.06			35138.8			148.733 *	148,534 *	189,672
39-023-WR-2		25339.4	1321.65	1008.47			43503.8		66.2178 *	165.78 *	729,326	55,1662
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-023-SE-1000	197.638			51.843 *	101.642			645,117	108.471 *	13,5161 *	10,153 *	
39-023-SE-500	110.289			25,0458 *	122,124			787,695	109,048 *	15,0226 *	13,1276 *	
39-023-WR1-A	168,408		7,12058 *	195,209	148,514			758,597	64,7873 *	14,6701 *	20,0452 *	
39-023-WR1-B	179,489		7,77696 *	758,029	209,307			494,074				
39-023-WR1-C	183,005			305,27	177,099			793,638			16,2138 *	
39-023-WR-1-COMP	210,152			369,66	184,492			707,355	60,0553 *	16,0663 *	21,0738 *	
39-023-WR-2	148,613			55,8725 *	197,591			461,918				

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

TELEGRAPH  
PA NO. 39-023



# **AIMSS SCORESHEET**

SITE NAME:  
PA NUMBER:

TELEGRAPH  
39-023

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.277
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		41
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	41.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>4543</b>
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.293
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		20
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	37
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>7589</b>
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.010
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>5</b>
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.009
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 THRU 42	2
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>2</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			
	(LINES 10 + 24 + 35 + 44) / 100,000			<b>0.12</b>

LINE NO.				SITE NAME:	TELEGRAPH
				PA NUMBER:	39-023
	<u>SITE SAFETY</u>				
1	THREAT	ACCESSIBILITY			10
2		OPEN SHAFTS	100 EA.		0
3		OPEN ADITS	50 EA.		0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		75
5		HAZ. STRUCTURES	40 EA.		80
6		EXPLOSIVES			0
7		HAZ. MATERIALS			0
8		HAZARDS SCORE	SUM LINES 2 THRU 7		155
9		POPULATION - 1 MILE			0
10	TARGETS	NEAREST RESIDENCE			0
11		RECREATIONAL USE			2
12		TARGETS SCORE	SUM LINES 9 THRU 11		2
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000		3.10



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Telegram Adit Discharge

LAB NO: W8577

DATE RECEIVED: 09-14-90

Hardness 39 mg/L as CaCO<sub>3</sub>

Total Extractable Metals

As 0.016 mg/L

Cd 0.0030 mg/L

Cu 0.13 mg/L

Fe 1.70 mg/L

Pb 0.003 mg/L

Zn 0.41 mg/L

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Telegram<sup>ph</sup> Discharge below Dump

LAB NO: W8581

DATE RECEIVED: 09-14-90

Hardness 24 mg/L as CaCO<sub>3</sub>

Total Extractable Metals

As <0.001 mg/L

Cd 0.0010 mg/L

Cu 0.02 mg/L

• Fe 0.32 mg/L

Pb 0.007 mg/L

Zn 0.20 mg/L

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Telegraph Mine Dump--08/24/90

LAB NO: S2682

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 3.88 SU

Total Metals

As 590 mg/Kg

Cd 3 mg/Kg

Cu 26 mg/Kg

Fe 23,200 mg/Kg

Pb 494 mg/Kg

Zn 56 mg/Kg





39-023, #7: Adit #1; SW-4 and SE-4 sample locations



39-023, #8: SW-3 sample location



39-023, #9: WR-1 and mill structure



39-023, #10: Mill structure





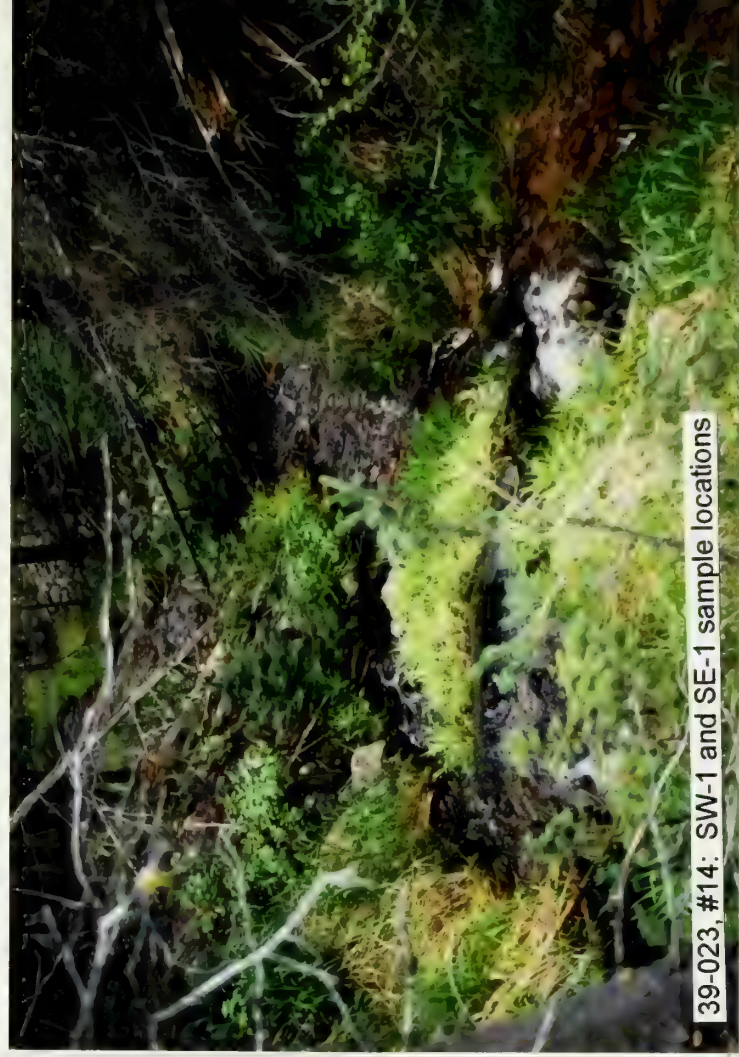
39-023, #11: Seep between WR-1 and WR-2



39-023, #12: Adit #2 and WR-2



39-023, #13: SW-2 and SE-2 sample locations



39-023, #14: SW-1 and SE-1 sample locations



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: THIRD TERM PA#: 39-024

Date: July 14, 1993 Time: 1300-1730

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Rain, hail; partly sunny; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #16: SW-1 location, downstream in Little Flume Gulch; #17-#19: WR-1 (reclaimed); #20: SW-2 location, upstream of site in gulch; #21: Background soil SS-1 location. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Waste rock is flattened (possible additives) and is revegetated (approx. 50% coverage) with grasses and straw.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Site has been reclaimed. Small gullies in dump face; monitor reclamation. Move waste rock from near creek.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): THIRD TERM PA#: 39-024

Legal Description: T 9N ; R 6W ; Sec. 28 , NE1/4 SE1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 30' 08" Longitude: W 112° 21' 09"

Primary Drainage Basin and Code: Little Blackfoot/17010201

Secondary Drainage Basin: Flume Creek

USGS Quadrangle map name(s): Mac Donald Pass

Mine Type/Commodities: Hardrock/Zinc, Copper, Lead, Gold, Silver

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Dena Strader,  
502 East Broadway, Missoula, MT 59802. (406) 549-5191; Helena  
National Forest.

Relationship to other mines/sites in the area/district: Placer  
claim in Little Flume Gulch downstream; Viking, 2 miles south;  
Julia, 3 miles south; Charter Oak, 4 miles southeast.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? MDSL reclamation; adit closed; dumps  
reclaimed (flattened, additives, vegetated); highwall (netting,  
straw, vegetated).

General site features: Elevation 5900' , Slope Steep ,  
Aspect South

Land use: Mining      , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 0.75 acres.  
Dimensions: 325'x100'

Predominant vegetation types: Ponderosa pine, Douglas fir

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 5 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by andesite. Site lies on hillside north of perennial Little Flume Gulch, which flows west-southwest past the site. Little Flume Gulch flows into perennial Telegraph Creek approx. 1 1/2 miles below the site and Telegraph Creek flows north approx. 3 miles to confluence with the Little Blackfoot River.

Mining/milling history, ore type/tenor, host rock, gangue: Vein filling; host is andesite; ore is galena, chalcopryite, tetrahedrite, and pyrite; gangue is quartz. Also reported at the mine: ankerite, tourmaline, calcite, and limonite.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment Closed  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting?  
N/A

Montana Bureau of Mines and Geology  
Water Well Log Data

11/03/1993

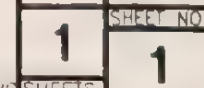
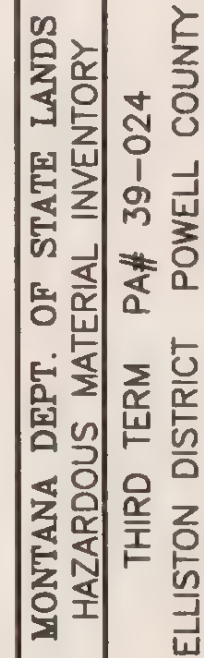
Well No.	Location	Depth	Yield	Static Water Level
M:59202	09N 06W 29 BA	48.0	17.0	27.00
M:131270	09N 06W 29 D	74.0	30.0	21.00
M:130877	09N 06W 29 DC	250.0	20.0	5.00
M:59206	09N 06W 32 AA	105.0	10.0	18.00
M:59207	09N 06W 32 ACDA	31.0	8.0	3.00











DRAWN \_\_\_\_\_ JTP \_\_\_\_\_ DATE 16 NOV 93  
DESIGNED \_\_\_\_\_ TPR \_\_\_\_\_ JOB NO. 93-17  
APPROVED WJB \_\_\_\_\_ F.B. NO. \_\_\_\_\_

**PIONEER**  
TECHNICAL SERVICES, INC. BUTTE, MT  
THOMAS ENGINEERING  
GREAT FALLS  
SPOKANE

10 SHEETS





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay):  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



# SOURCE INVENTORY FORM

**SAMPLERS:** Tuesday, Belanger

[illegible]

2. Direct reading (Galvanometer), 3. Saturated Paste (Orion Meter)

**Comments or deviations from SOPs:** 39-024-WR-1 is composite of WR-1A and -1B.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes ☐, No ☒, Number:  Identification:

Filled shafts: Yes ☐, No ☒, Number:  Identification:

Seeps/Springs: Yes ☐, No ☒, Number:  Identification:

Groundwater wells within 4 miles?: Yes ☒, No ☐;

Number of well logs: 91

Distance to nearest well used for drinking? There appears to be a residence 1 1/4 mile from the site on Telegraph Creek; Sunshine Camp is 3 miles upgradient.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite ☐, Probable ☐, Possible ☐, Unlikely ☒.

Reclaimed waste rock lies on hillside with Flume Creek below it; metal values are at or just above expected background levels.

Other observations/notes: N/A



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Little Flume Gulch

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-1

Approximate Flood frequency?      1 yr, X 10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 2 during investigation  
High Flow: 11 cfs, Average Flow: 1.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 8 feet from WR-1 to Little Flume Gulch.

Surface water draining onto or through waste sources: Yes     , No X,  
Describe: Runoff only

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Little Blackfoot River has agriculture, irrigation, fishery, recreation, wetlands, and a YMCA camp.

Observed erosional/sedimentation/stream turbidity problems? Yes     , No X, Distance downstream (ft)?      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): N/A



SAMPLERS: Tuesday, Belanger

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH  $\leq$  5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 1 to 2 acres

Wetlands present: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Carbonate rocks/soils: Yes\_\_\_, No X, Describe:\_\_\_\_\_

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30 X; 30-100\_\_\_;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? 1.25 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Tuesday, Belanger

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Beer  
cans; cabin

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment _____
Wilderness Area -	Yes____, No <u>X</u> , Comment _____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment _____
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>3</u>
Sport Fishery Classification -	<u>3</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_

## Bibliography

- MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin No. 98, Written by H.G. McClernan, April 1976.
- MBMG, Title Unknown, Powell County, Bulletin No. 30, Date Unknown, p. 33.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDHES/WQB, Analytical Data for Third Term, June 1, 1977.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Third Term site, Prepared by Northern Engineering and Testing, May 12, 1988.
- USGS, Topographic Map, Mac Donald Pass, Montana, 7 1/2 minute Quadrangle, 1989.





LABORATORY ANALYTICAL DATA

THIRD TERM  
PA NO. 39-024



Third Term PA# 39-024  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-024-SE-1	51 J	199	3.6 J	24.9	8.9	23.6 JX	25500	0.107 J	3680	9 JX	20 J	9 UJ	132 J	NR
39-024-SE-2	23 J	116	9.8 J	28.2	3.5	169 JX	11100	0.072 J	3300	11 JX	13 J	6 UJ	405 J	NR
39-024-WR-1	29 J	93.7	2.8 J	6.3	83.2	116 JX	28400	0.12 J	281	42 JX	200 J	10 J	128 J	NR
BACKGROUND	20 J	180	1.9 J	8.2	39.2	29 JX	15900	0.067 J	588	19 JX	28 J	6 UJ	123 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR ACID BASE POTENT.		ORGANIC SULFUR		SULFUR ACID BASE POTENT.	
	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000
BACKGROUND	0.02	0.62	4.49	3.86	0.01	0.01	<0.01	0.31	4.18			
39-024-WR-1	0.9	28.1	201	173	0.53	0.16	0.21	5	196			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
39-024-SW-1	6.90	9.30	2.57 U	9.70 U	6.83 U	24.50	628	0.240	58.5 J	12.7 U	1.25 J	30.7 U	89.1 J	25.2
39-024-SW-2	6.11	14.30	2.57 U	9.70 U	6.83 U	1.67	598	0.210	32.5 J	12.7 U	1.22 J	30.7 U	7.57 U	24.5

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-024-SW-1	92	< 5.0	10	< 0.05	NR
39-024-SW-2	87	< 5.0	8	< 0.05	NR

LEGEND

SE1 - Downstream of dump in Little Flume Gulch.  
SE2 - Upstream from dump in Little Flume Gulch.  
WR1 - Composite of WR1A and 1B.  
BACKGROUND - West of subsample WR1B, From the Third Term (39-024-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.





**XRF ANALYSIS RESULTS**

**THIRD TERM  
PA NO. 39-024**



Mine Name: Third Term PA# 39-024

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-024-SS-1		20303.2	14677.7	2926.89		511.247 *	24413.7			143.832 *	60.714 *	387.351
39-024-WR1-A		18896.8	104718	2128.2	202.929 *		39336		140.067 *	214.602	66.7018 *	294.78
39-024-WR1-B		22177.3	99317.1	2760.15	239.067 *		43842.6		58.6584 *	147.346 *	53.4027 *	377.092
39-024-WR-1-COMP		20811.5	100705	2561.36	221.148 *	391.607 *	41652.9		89.8636 *	154.323 *		324.659
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-024-SS-1	216.584	38.4076 *			134.716			794.085	112.055 *		17.2623 *	
39-024-WR1-A	160.211	56.065 *		280.776	120.986			739.421	108.954 *		15.6374 *	
39-024-WR1-B	140.912	56.1446 *		73.496 *	109.088			658.696	117.17 *		11.325 *	
39-024-WR-1-COMP	134.39			182.407	92.7939			594.665	101.587 *		10.8851 *	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

THIRD TERM  
PA NO. 39-024



**AIMSS SCORESHEET**

SITE NAME:

THIRD TERM

PA NUMBER: \_\_\_\_\_

39-024

LINE NO.				
<b><u>GROUNDWATER PATHWAY</u></b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		10
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	100
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	100
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.253
6	GW - TARGETS	WELLS - 1 MI. x 2.5		12.5
7		WELLS - 1 TO 4 MI		86
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	98.5
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>2492</b>
<b><u>SURFACE WATER PATHWAY</u></b>				
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		50
13A		CONTAINMENT		10
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	200
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	550
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.284
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	22
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>3436</b>
<b><u>AIR PATHWAY</u></b>				
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.028
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	20
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>28</b>
<b><u>DIRECT CONTACT PATHWAY</u></b>				
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.025
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	6
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>23</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b> (LINES 10 + 24 + 35 + 44) / 100,000			<b>0.06</b>

LINE  
NO.

SITE NAME:  
PA NUMBER:

THIRD TERM  
39-024

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	0
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	6
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	0.00



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**



STATE	MONTANA	COUNTY	POWELL
LAT.-LONG.	462956N 1122122W	SAMPLE LOCATION	9N 6W 280CC
STATION CODE		ANALYSIS NUMBER	77W1017
DATE SAMPLED	06-01-77	DRAINAGE BASIN	076G -CLARK FK R
TIME SAMPLED	1130	WATER FLOW RATE	
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

## SAMPLING SITE: FLUME GULCH

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	9.9	0.206
IRON (FE)			FLUORIDE (F)		
MANGANESE (MN)			PHOSPHATE (PO4 AS P)		
ALUMINUM (AL)			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	9.900	0.206
-------------	-----	-----	------------	-------	-------

LABORATORY PH	7.60	TOT HARDNESS (MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY (MG/L-CACO3)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (JTU)	
LAB CONDUCTIVITY-UMHOS-25C	63.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L		P A R A M E T E R S	
LEAD, TR (MG/L AS PB)	< 0.05	IRON, TR (MG/L AS FE)	1.2
CADMIUM, TR (MG/L AS CD)	< 0.005	COPPER, TR (MG/L AS CU)	< 0.01
ZINC, TR (MG/L AS ZN)	< 0.01	MANGANESE, TR (MG/L AS MN)	.06
ARSENIC, TR (MG/L AS AS)	.011	SILVER, TR (MG/L AS AG)	< 0.01

REMARKS: BOULDER BATHOLITH 0662 NO PERIPHYTON SAMPLE

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVLENTS PER LITER  
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
 (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 02	SAMPLER DP	HANDLING 2100	ANALYST LAB	LAB	WQBH
COMPLETED 08-11-77	COMPUTER RUN	08/29/77	DATA 0975/PRDG	0376 FUND	0662
STND DEV. ION BALANCE	2.25	CA	MG	NA	K
SEGMENT	MPDES	0.0	0.0	0.0	0.0
CALC. MEQ/L=	INSUFFICIENT DATA	0.0	0.0	0.0	0.0

77W1017







39-024, #16: SW-1 sample location



39-024, #17: WR-1 (reclaimed)



39-024, #18: WR-1 (reclaimed)



39-024, #19: WR-1 (reclaimed)





39-024, #20: SW-1 sample location upstream of Little Flume  
Gulch



39-024, #21: Background soil; SS-1 sample location

MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ANNA P./HATTIE M. PA#: 39-044

Date: June 28, 1993 Time: 0930

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H  
Lasher, Pioneer

Visitors: Mr. Dave Newman, owner

Weather/Seasonality Observations: Cool to warm (45°-55°F); rain;  
hail; partly cloudy; slight breeze (< 5 mph); cool, wet spring and  
summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #30: WR-2; #31: WR-3  
with shaft with collapsed headframe and ore chutes; #32: WR-1 and  
mill building. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Possible to  
reprocess waste rock for lead and other metals. Adit discharge has  
low pH and exceeds Maximum Contaminant Levels for Cd; may need  
treatment.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ANNA P./HATTIE M. PA#: 39-044

Legal Description: T 8N ; R 6W ; Sec. 15 , NE1/4 NE1/4NW 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 27' 04" Longitude: W 112° 20' 27"

Primary Drainage Basin and Code: Little Blackfoot River/17010201

Secondary Drainage Basin: Telegraph Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active ☐ , Inactive/Exploration ☒ , Abandoned ☐ .

Ownership status: Known YX ☐ N ☐ ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Dave Newman,  
Box 159, Elliston, MT 59728-0159. (406) 492-7272; Helena National  
Forest.

Relationship to other mines/sites in the area/district: Many  
mines in district

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 6730' , Slope 15° ,  
Aspect West

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 0.17 acres.  
Dimensions:

Predominant vegetation types: Douglas fir, Ponderosa pine

Access: roads - good ☐ , poor ☐ , 4wd ☒ , trail ☐ .  
Other logistical considerations (proximity to other sites). Near  
Sure Thing and Little Orphan Boy mines

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on east side of Telegraph  
Creek valley. Water running off-site flows west to Telegraph  
Creek which flows north. Site is underlain by quartz monzonite of  
Boulder Batholith cut by an apalite dike.

Mining/milling history, ore type/tenor, host rock, gangue:  
Mill building on-site; all tailings sent off-site; 0.5 Au/1 ton  
ore. Mineralization occurs in a northeast trending vein which  
follows contact of quartz monzonite with an apalite dike. Hypogene  
minerals include pyrite, arsenopyrite, sphalerite, galena,  
chalcopyrite, hematite and magnetite. Gangue minerals are  
vitreous quartz.

Mine Operation?

Shafts - Yes X, No    , # 1, Comment Open; 20' deep then caved  
Adits - Yes X, No    , # 2, Comment Caved  
Pits - Yes    , No X, #    , Comment      
Placers - Yes    , No X, #    , Comment      
Other - Yes    , No X, #    , Comment    

Mill Operation? Yes X, No    . If yes answer the next three  
questions:

Period(s) of Operation: Unknown

Origin of Ore Milled - Custom Mill X Dedicated Mill    ; Number and  
names of mines that supplied mill feed:    

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
Tailings taken off-site possibly to Wasa site.

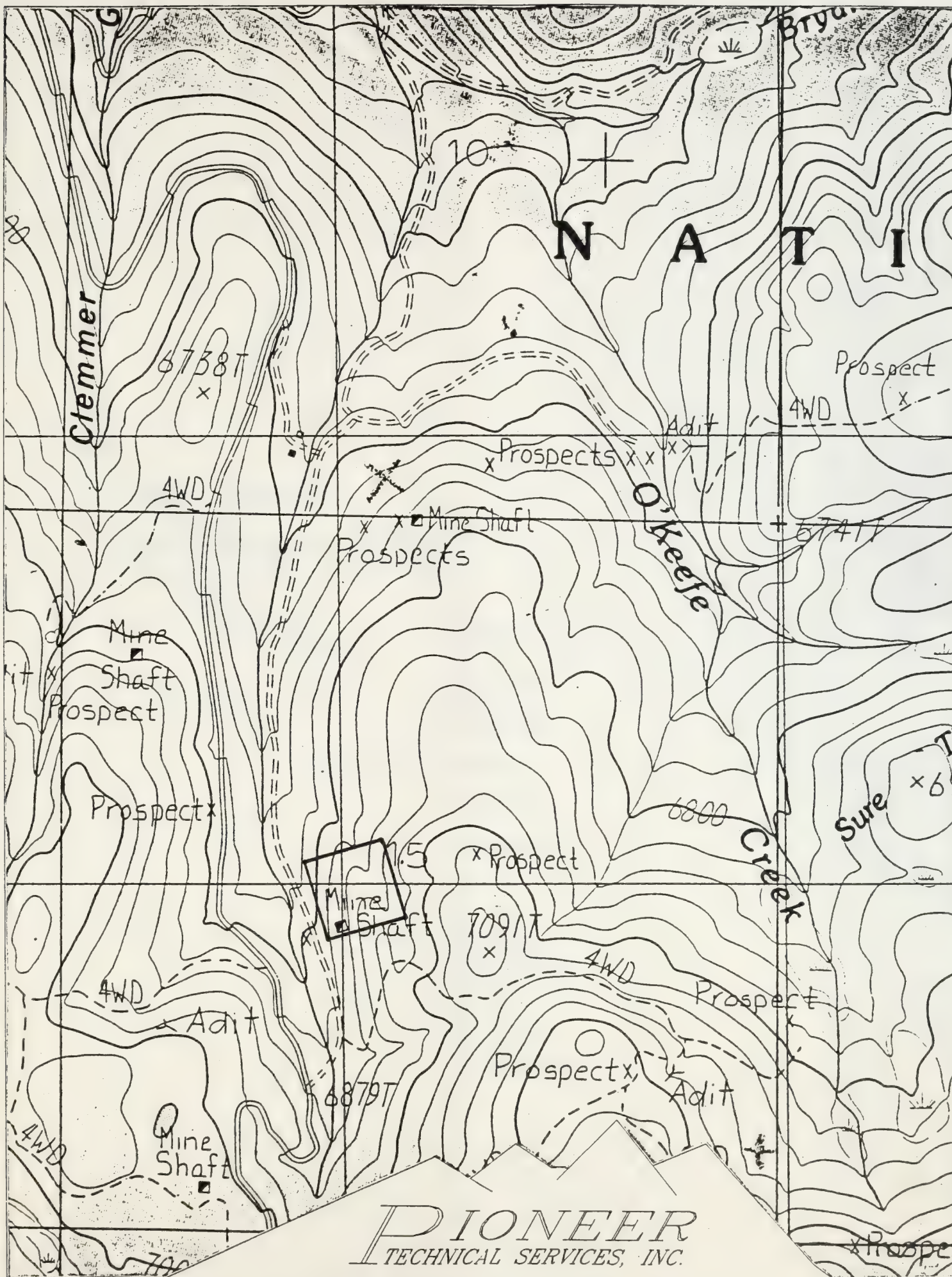
Montana Bureau of Mines and Geology  
Water Well Log Data

10/22/1993

Well No.	Location	Depth	Yield	Static Water Level
M:57348	08N 06W 16 AAC	50.0	15.0	0.00





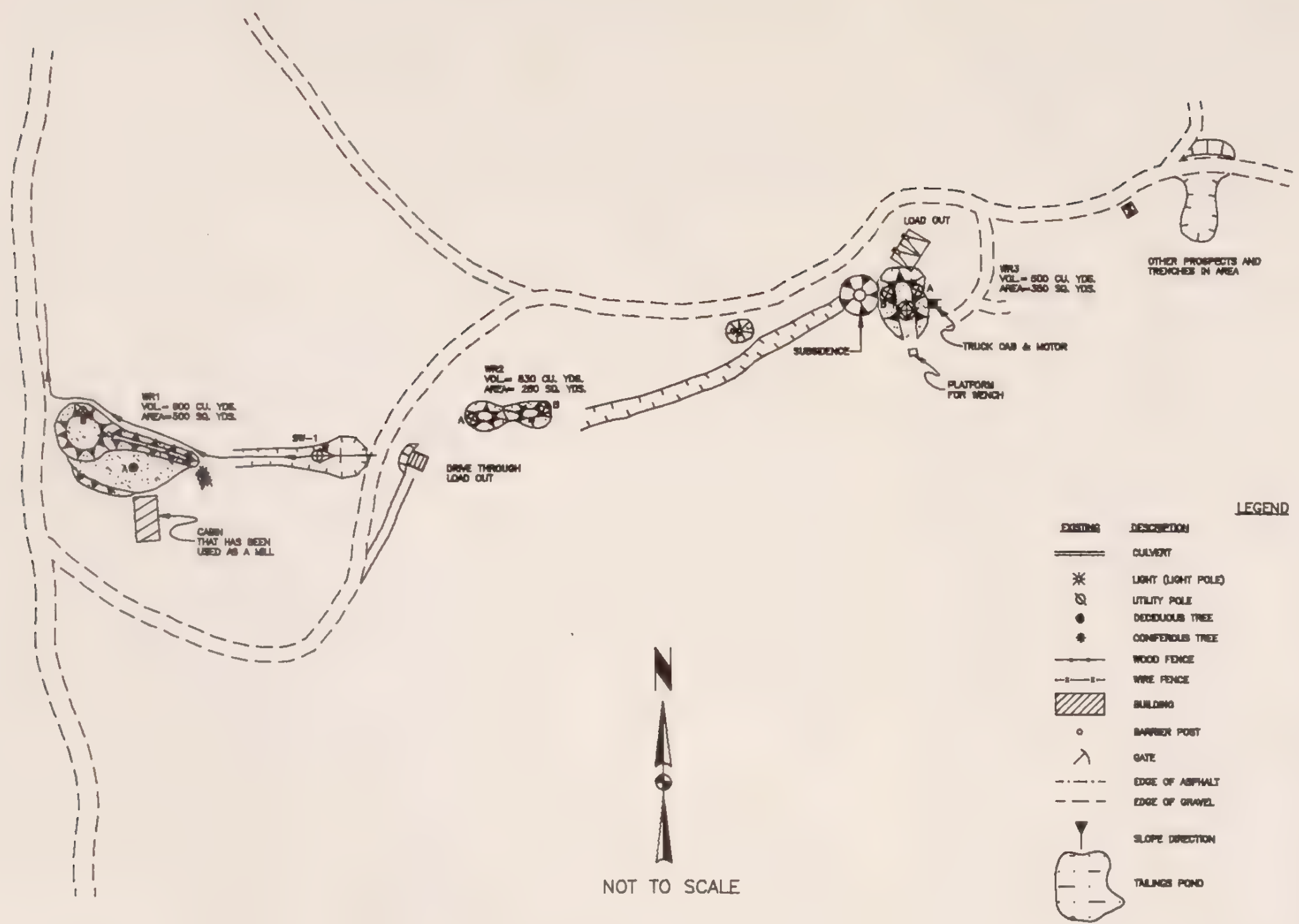


ANNA P./HATTIE M., P.A. NO. 39-044

T08N, R06W, SECTION 15

SCALE: 1" = 1000'





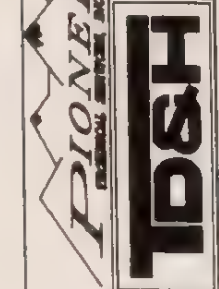
NOT TO SCALE

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

ANNA R. / HATTIE M. PA# 39-044  
ELLISTON DISTRICT POWELL COUNTY

DATE 18 NOV 92  
JOB NO. 93-17  
F.B. NO.

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON







## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A



**SAMPLERS:** Babits, Pierson, Lasher

[illegible]

0-Direct reading (Kelvey Meter); 3-Saturated Paste (Orion Meter)

**Comments or deviations from SOPs:** 39-044-WR-1 is composite of WR-1A and -1B, and WR-3B.  
39-044-WR-2 is composite of WR-2A and -2B, and WR-3A.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Associated  
with WR-1

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes X, No     , Number: 4 Identification: Associated  
with WR-1

Groundwater wells within 4 miles?: Yes X, No     ;

Number of well logs: 24

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable X, Possible     , Unlikely     .

Uncontained sources containing elevated metal values, particularly  
arsenic. Groundwater appears to be shallow and in contact with at least  
WR-1.

Other observations/notes: N/A



**SAMPLERS:** Babits, Pierson, Lasher

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

**Comments or Deviations from the SOPs (Pioneer SAP, 1993):** Adit at WR-1 is collapsed and sample not taken at origin of flow.

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Dry streambeds: Yes\_\_\_\_, No X, Name(s):\_\_\_\_\_

Other surface water: Yes\_\_\_\_, No X, Name(s)/Description:\_\_\_\_\_

Waste materials within any floodplain: Yes\_\_\_\_, No X Source ID(s):\_\_\_\_\_

Approximate Flood frequency?\_\_\_1 yr,\_\_\_10 yr,\_\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow:\_\_\_\_\_, Average Flow:\_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)?  
500 feet between WR-1 and Telegraph Creek with road in between.

Surface water draining onto or through waste sources: Yes\_\_\_\_, No X,  
Describe:\_\_\_\_\_

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, fishery, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_,  
No X, Distance downstream (ft)?\_\_\_\_\_ Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present):  
No problems seen with Telegraph Creek; adit discharge flows down road  
and not into creek.



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes X, No     , Describe: Limited streamside

Carbonate rocks/soils: Yes     , No X, Describe:     

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100 X; 100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ; Comments     

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS:** Babits, Pierson, Lasher

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe:\_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments\_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium____, Low <u>Not Rated</u>
Wetlands Frontage -	High____, Medium____, Low <u>Not Rated</u>
Fisheries Habitat and Species Classification -	<u>1</u>
Sport Fishery Classification -	<u>4</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Shaft approx. 20 feet deep

Hazardous structures: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Mill building and loadout

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 3, types and locations: Waste rock piles

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_

## Bibliography

MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976, pp. 7-17.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB, Environmental Assessment Analytical Data for Anna R./Hattie M., Prepared by MSE, Inc., October 4 and 29, 1990.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Anna P./Hattie M., Prepared by Northern Engineering and Testing, May 19, 1988.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.





LABORATORY ANALYTICAL DATA

ANNA P./HATTIE M.  
PA NO. 39-044



Anna R./Hattie M. PA# 39-044  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/28/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-044-WR-1	3540	25.1	5.9	28.6	2.4	343	27000	0.721 J	5840	37	2030	14 J	673	NR
39-044-WR-2	10400	18.5	0.5 U	4.1	1 U	167	54900	0.195 J	63.3	4	5980	38 J	272	NR
BACKGROUND	88	61	1.2 J	6.9	5.4	32.7	18500	0.017 JX	1220 J	10	62	5 J	133 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL				SULFUR				PYRITIC				SULFUR			
	SULFUR %	ACID BASE t/1000	NEUTRAL POTENT. t/1000	POTENT. t/1000	ACID BASE POTENT. t/1000	SULFUR %	ORGANIC SULFUR %	ACID BASE POTENT. t/1000	SULFUR %	ACID BASE POTENT. t/1000	ACID BASE POTENT. t/1000	ACID BASE POTENT. t/1000	SULFUR %	ACID BASE POTENT. t/1000	ACID BASE POTENT. t/1000	ACID BASE POTENT. t/1000
39-044-WR-1	0.57	17.8	1.37	-16.	-16.	0.36	0.16	1.56	0.05	0.05	0.16	1.56	0.05	0.05	-0.19	-0.19
39-044-WR-2	2.53	79	-10.	-89.	-89.	0.73	0.58	38.1	1.22	1.22	0.58	38.1	1.22	1.22	-48.8	-48.8

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
39-044-SW-1	40.2	2.67	6.93 J	11.9 JX	5 U	64	1390	0.038 U	630	10.4	12.5	18.3 U	810	57.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-044-SW-1	145	< 5.0	49	0.15	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, and 3B.  
WR2 - Composite of subsamples WR2A, 2B, and 3A.  
BACKGROUND - From Ontario Millsite (39-010-SS-1).

SW1 - Adit discharge from waste rock dump 1.





XRF ANALYSIS RESULTS

ANNA P./HATTIE M.  
PA NO. 39-044



XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-044-WR1-A		13016.3	8852.92				48402.6			327.293	1153.16	226.488
39-044-WR1-B		27373.6	6717.47				67965.5		154.781 *	439.777	4734.83	199.539
39-044-WR2-A		14930.3	5854.98				116441	601.321 *	212.269 *	638.452	11346.3	145.942
39-044-WR2-B		11109	6531.85				85469.6		141.157 *	505.097	8078.8	127.328
39-044-WR3-A		20432.6	5386.15				67307.5	471.829 *	106.018 *	393.096	18213	153.567
39-044-WR3-B		6340.93	6625.83			18717.6	110144		977.535	1654.86	5746.3	179.541
39-044-WR-1-COMP		13030.9	7310.74			14499.7	83109.8		441.958	1025.26	3697.71	210.956
39-044-WR-2-COMP		14668.4	6558.25				119515		289.911	709.563	13563.9	193.318
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-044-WR1-A	156.314		5.25724 *	695.436	149.813			594.529			18.6649 *	
39-044-WR1-B	139.798		21.2327 *	5426.97	220.647		93.7437 *	741.514	139.471 *		40.9177 *	
39-044-WR2-A	62.627		16.724 *	7168.1	147.293		155.445 *	168.351	195.256 *		39.0089 *	
39-044-WR2-B	148.982		22.6083	2310.06	160.176		79.6538 *	552.487			19.5984 *	
39-044-WR3-A	23.0816 *		21.9298	5814.99	204.022		130.572 *	162.648	287.473 *		64.9882	
39-044-WR3-B	42.3767		28.2208	1831.43	83.2507			309.769	205.69 *		13.4124 *	
39-044-WR-1-COMP	109.795		22.9623	1921.57	147.624		60.9191 *	540.193			22.0488 *	
39-044-WR-2-COMP	65.2718		27.7781	6308.37	170.487		144.007 *	447.908	270.699 *		41.1159 *	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

ANNA R./HATTIE M.  
PA NO. 39-044



# AIMSS SCORESHEET

SITE NAME:

ANNA P./ HATTIE M.

PA NUMBER:

39-044

LINE NO.		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD	CONTAINMENT		20
3B	OF RELEASE	GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	22.025
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		23
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	25.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	224655
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD	EXCEEDENCES		0
13A	OF RELEASE	CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	22.879
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		20
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	37
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	33861
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD	CONTAINMENT		10
26B	OF RELEASE	DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.226
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	30
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	339
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF	ACCESSIBILITY		20
37B	EXPOSURE	DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.217
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	1
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	22
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			2.59
	(LINES 10 + 24 + 35 + 44) / 100,000			

SITE NAME: ANNA P. / HATTIE M.  
 PA NUMBER: 39-044

**SITE SAFETY**

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	180
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>3.60</b>



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

# RECEIVED

## ELLISTON MINING DISTRICT WATER QUALITY FIELD PARAMETERS

SEP 28 1990

ROBERT PECCIA  
& ASSOCIATES

SITE NAME: LILLY OFPHAM BOY MINE  
DATE: 23-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (uamhos/cm)	TEMP. (celsius)	
ADIT	1-2	8.53	421 688.2	5.1	SAMPLE COLLECTED 8.5
TELEGRAPH CK (UPGRADIENT)	30	8.51	40 59.6	8.5	
TELEGRAPH CK (DOWNGRADIENT)	30	8.58	57 77.9	11.8	STREAM CONTACTS DUMP MATERIAL AND RECEIVES ADIT DISCHARGE

SITE NAME: ANNA R./HATTIE M.  
DATE: 23-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (uamhos/cm)	TEMP. (celsius)	
ADIT	5-10	8.50	91 145.1	6.0	
SEEP (SLW DUMP)	1	8.56	463 605.6	14.2	SAMPLE COLLECTED
DITCH (RECEIVING)	2.4	8.24	125 151.1	17.0	DITCH COLLECTS SITE DISCHARGE EVENTUALLY FLOW TELEGRAPH CREEK

SITE NAME: SURE THING MINE  
DATE: 23-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (uamhos/cm)	TEMP. (celsius)	
ADIT	1	8.36	505 840.0	4.3	SAMPLE COLLECTED, FLOW CURRENTLY GOES SUBSURFACE 150' FROM ADIT 1.3

\* corrected for 25°C

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Anna R/Hattie M Dump Discharge

LAB NO: W8575

DATE RECEIVED: 09-14-90

Hardness 55 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.877 mg/L

Cd 0.0023 mg/L

Cu 0.02 mg/L

Fe 22.8 mg/L

Pb 0.137 mg/L

Zn 0.47 mg/L

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Anna R./Hattie M. Waste Rock Dump--08/23/90

LAB NO: S2688

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.51 SU

Total Metals

As 1270 mg/Kg

Cd 11 mg/Kg

Cu 20 mg/Kg

Fe 40,000 mg/Kg

Pb 1460 mg/Kg

Zn 137 mg/Kg





39-044, #31: WR-3



39-044, #30: WR-2



39-044, #32: WR-1 and mill building





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MOUNTAIN VIEW PA#: 39-062

Date: July 14, 1993 Time: 0830

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer  
Clark, Pioneer

Visitors: Earl McCurley, MDSL  
Rick Berger, MDSL Helicopter Pilot

Weather/Seasonality Observations: Cool (55°F); partly cloudy,  
hail and rain while finishing investigation.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #31: WR-1, facing  
north; #32: WR-3 dump associated with small mill approx. 300 yds.  
from the site; #33: TP-1 on mill southwest of site; #34: WR-1 from  
mill, facing northeast. Video Tape No. 4

General Comments/Observations (not covered specifically in attached Inventory Forms): This site is one of many mines located in this drainage.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study/evaluate water treatment alternatives. Establish an isolated  
drainage. Grade, amend, and revegetate WR-1.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MOUNTAIN VIEW PA#: 39-062

Legal Description: T 8N ; R 6W ; Sec. 6 , SW1/4 NW1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 28' 26" Longitude: W 112° 24' 20"

Primary Drainage Basin and Code: Little Blackfoot/17010201

Secondary Drainage Basin: Unnamed Tributary

USGS Quadrangle map name(s): Bison Mountain

Mine Type/Commodities: Hardrock/Lead, Silver, Gold

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Ben Sinerius,  
P.O. Box 492, Deer Lodge, MT 59722. (406) 846-1430; Helena  
National Forest.

Relationship to other mines/sites in the area/district: Appears  
that ore was hauled up to mill approx. 200 yds. southwest of this  
site.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 6800' , Slope 15°-20° ,  
Aspect Southwestern

Land use: Mining X , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 0.75 acres.  
Dimensions:     

Predominant vegetation types: Douglas fir, Lodgepole pine, alder

Access: roads - good      , poor      , 4wd X , trail      .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 4 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on unnamed tributary of  
Little Blackfoot River.

Mining/milling history, ore type/tenor, host rock, gangue: No  
specific history known for site. Ore was vein deposits in either  
quartz monzonite or andesite. Vein was quartz and black  
tourmaline. Ore minerals include galena, sphalerite, pyrite, and  
tetrahedrite.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 3, Comment 1 open; 2 caved  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: Mill 200 yds. to southwest was not  
investigated, but sample taken of tailings.

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

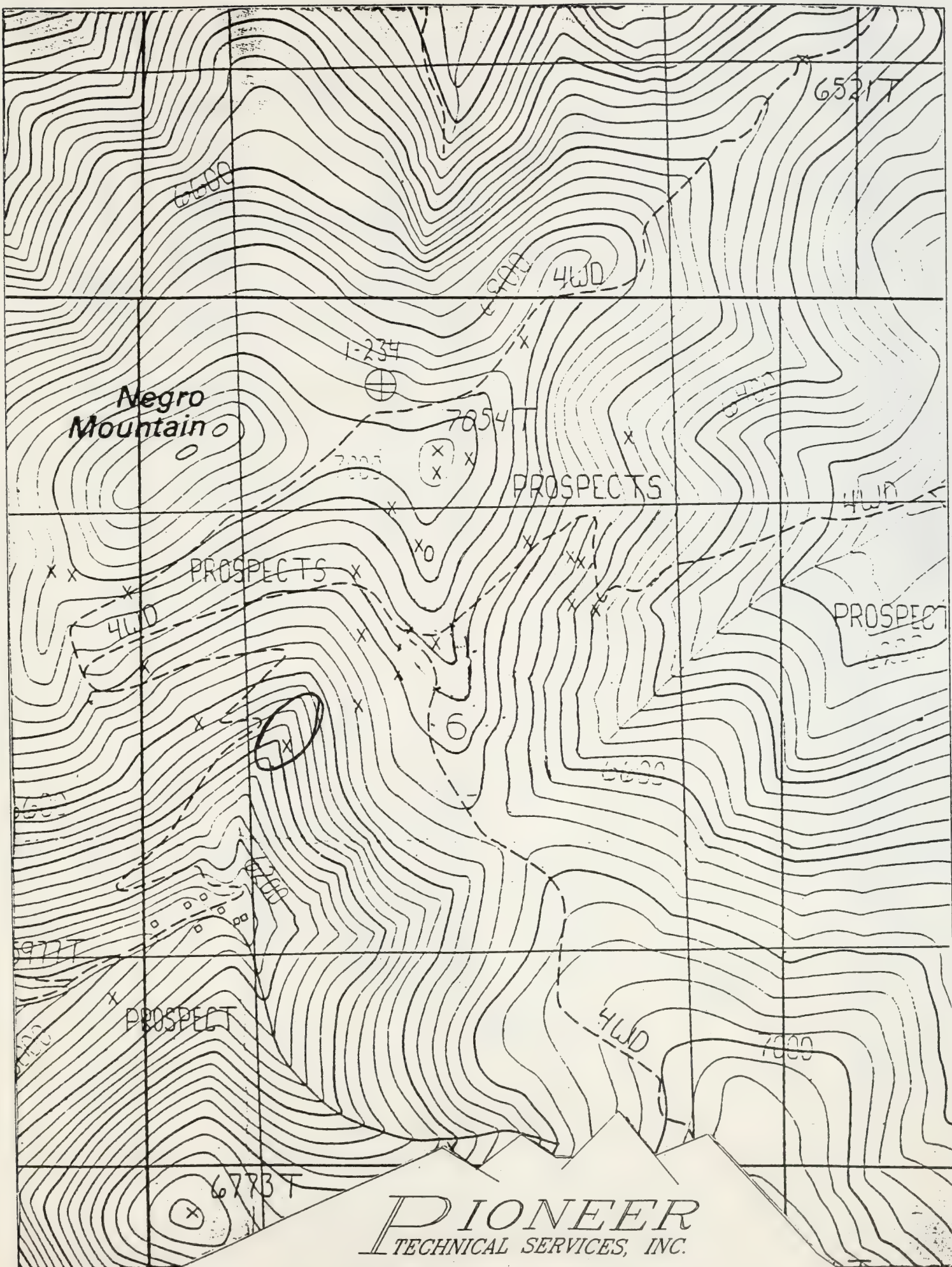
Montana Bureau of Mines and Geology  
Water Well Log Data

11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:5473	08N 06W 05 AA	0.0	0.0	0.00
M:59206	09N 06W 32 AA	105.0	10.0	18.00
M:59207	09N 06W 32 ACDA	31.0	8.0	3.00
M:57351	08N 07W 01 B	41.0	30.0	4.00







**PIONEER**  
TECHNICAL SERVICES, INC.

MOUNTAIN VIEW, P.A. NO. 39-062  
T08N, R06W, SECTION 06  
SCALE: 1" = 1000'









## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A



# SOURCE INVENTORY FORM

**SAMPLERS:** Bullock, Flammanq, Clark

[illegible]

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs:** 39-062-WR-1 is composite of WR-1A and -1B and WR-2A and -2B.  
ND = Not Determined



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 1 Identification: Adit #1

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes X, No    , Number: 1 Identification: At toe of WR-2; evaluated under SW-1 sample

Groundwater wells within 4 miles?: Yes X, No    ;  
Number of well logs: 37

Distance to nearest well used for drinking? 1.5 miles according to the topographic map

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable X, Possible    , Unlikely    .

Elevated metals in discharge and dump material.

Other observations/notes: N/A



**SAMPLERS:** Bullock, Flammang

[illegible]

FROM: Retention (R) or Measured (M) from edit, shift, snap or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Unnamed tributary to the Little Blackfoot River

Dry streambeds: Yes X, No     , Name(s): The tributary is dry above this site.

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s):     

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.07 during investigation  
High Flow: 0.5 cfs, Average Flow: 0.05 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Adit discharge flows through WR-1 underground.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Fishery, irrigation, stock watering, T&E - Bald Eagle

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? >500 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Drainage between WR-1 and WR-2 is impacted. Sediment XRF analysis demonstrates elevated levels 500 feet below WR-2.



**SAMPLERS:** Bullock, Flammang, Clark

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No upstream sample - source of stream appears to be Adit #1 mouth.

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 2 acres; area is available approx. 500' down drainage in the drainage bottom.

Wetlands present: Yes X, No   , Describe: Small wetlands associated with the stream below this site.

Carbonate rocks/soils: Yes   , No X, Describe: Although none observed in the dump, water exits toe of dump at a higher pH than it enters.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10   ; 10-30 X; 30-100   ; 100-300   ; 300-1,000   ; 1,000-3,000   ; 3,000-10,000   ; 10,000 or greater   ; Comments   

Nearest residence(ft or miles)? Approx. 1.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS:** Bullock, Flammanq, Clark

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe:\_\_\_\_\_ Gatorade bottle

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Bald Eagle  
Bat Habitat - Yes\_\_\_\_, No X, Comment\_\_\_\_\_

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 3  
Sport Fishery Classification - 3

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Adit #1, can see 3/4 full of water

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_, Number 1, types and locations: WR-1 slopes are unvegetated and at angle of repose.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_

## **Bibliography**

MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB, Environmental Assessment Data for Mountain View, Prepared by MSE, Inc., October 4 and 29, 1990.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Mountain View, Prepared by Northern Engineering and Testing, June 14, 1988.

USGS, Topographic Map, Bison Mountain, Montana, 7 1/2 minute Quadrangle, 1985.





LABORATORY ANALYTICAL DATA

MOUNTAIN VIEW  
PA NO. 39-062



Mountain View PA# 39-062  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/14/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-062-SE-1	4390 J	105	74.4 J	16.8	3.8	194 JX	75800	0.195 J	2400	5 UJX	1700 J	49 J	11500 J	NR
39-062-WR-1	706 J	31	12.4 J	9.8	3	46.2 JX	28300	0.177 J	1130	3 JX	687 J	41 J	1870 J	NR
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR	
	%	1/1000	ACID BASE	POTENT.	NEUTRAL.	ACID BASE	POTENT.	%	ACID BASE	POTENT.	1/1000	1/1000
39-062-WR-1	2.97	92.8	52.9	-39.	0.98	1.24	0.75	38.7	14.2			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
39-062-GW-1	149 J	9.57	2.57 U	9.70 U	6.83 U	1.55 U	1660	0.038 U	928	12.7 U	1.37 J	31.1	132	111
39-062-SW-1	92.6 J	5.10	4.70 J	9.70 U	6.83 U	1.55 U	190	0.038 U	23.1	12.7 U	4.31 J	30.7 U	931	116

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-062-GW-1	222	< 5.0	58	< 0.05	NR
39-062-SW-1	204	< 5.0	65	< 0.05	NR

LEGEND

SE1 - Just downstream of waste rock dump 2.  
WR1 - Composite of subsamples WR 1A, 1B, 2A, and 2B.  
BACKGROUND - From the Charter Oak Mine (39-000-SS-1).

GW1 - At the mouth of adit #1.  
SW1 - Same as sample SE1.





**XRF ANALYSIS RESULTS**

**MOUNTAIN VIEW  
PA NO. 39-062**



XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-062-SE-1000		5737.53	6530.16	670.82		2599.85	29078.5		159.358 *	3563.88	2158.76	132.061
39-062-SE-500		4912.04	5975.38	764.312	233.09 *	1719.24	26057.2		91.5593 *	1847.94	1523.22	249.134
39-062-TP-1		27309.4	3617.13	2571.39		1832.18	37118.5			276.931	6376.58	146.845
39-062-WR1-A		25901.3	22072	1811.8		657.322 *	28284		117.653 *	1534.58	2114.44	80.1438
39-062-WR1-B		31284.2	15016.7	1246.62		1074.21	11596.5		52.3483 *	793.211		249.647
39-062-WR2-A		24900.4	29339.7	2116.52		2682.18	28877.2		51.825 *	3964.51	602.261	159.165
39-062-WR2-B		16687.1	29569.4	1694.14		2083.03	29282.6		89.9713 *	1613.97	743.068	327.167
39-062-WR3-A		15703.9	19796.6	2343.18	180.401 *	1845	51151.2			253.654	802.861	674.862
39-062-WR-1-COMP		25749.6	25774.7	1976		1750.51	27615.6		66.7559 *	1932.17	1031.38	215.234
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-062-SE-1000	72.6423			1358.04	69.6297			94.9854				
39-062-SE-500	138.693			484.475	90.8089			536.001	90.4333 *		12.979 *	
39-062-TP-1	179.879			3289.29	195.416		136.4 *	578.159			12.4646 *	
39-062-WR1-A	178.692			2654.99	178.488		463.329	246.485	105.763 *			
39-062-WR1-B	220.568			387.825	169.695			1213.1			19.1425 *	
39-062-WR2-A	214.548			356.188	160.315			509.524			12.8075 *	
39-062-WR2-B	156.593			337.641	112.366			536.477			11.9182 *	
39-062-WR3-A	194.854			205.642	101.175			760.806			16.712 *	
39-062-WR-1-COMP	211.564			1005.29	155.836		140.312 *	744.962			23.2964 *	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

MOUNTAIN VIEW  
PA NO. 39-062



# AIMSS SCORESHEET

SITE NAME:

MOUNTAIN VIEW

PA NUMBER:

39-062

LINE

NO.

		<b>GROUNDWATER PATHWAY</b>		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.340
6		WELLS - 1 MI. x 2.5		10.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		33
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	43.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>74648</b>

		<b>SURFACE WATER PATHWAY</b>		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	500
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.549
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18	SW - TARGETS	WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>40941</b>

		<b>AIR PATHWAY</b>		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.132
29		POPULATION - 4 MILES		10
30	AIR - TARGETS	NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>66</b>

		<b>DIRECT CONTACT PATHWAY</b>		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.125
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 THRU 42	2
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>38</b>

45 **TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**  
(LINES 10 + 24 + 35 + 44) / 100,000

1.16

SITE NAME: MOUNTAIN VIEW  
PA NUMBER: 39-062

LINE NO.	SITE SAFETY			
1	THREAT	ACCESSIBILITY		20
2	HAZARDS	OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4		UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	50
9	TARGETS	POPULATION - 1 MILE		0
10		NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 THRU 11	2
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000	2.00



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Mt View Adit Discharge

LAB NO: W8579

DATE RECEIVED: 09-14-90

Hardness 104 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.129 mg/L

Cd <0.0001 mg/L

Cu <0.01 mg/L

Fe 1.33 mg/L

Pb <0.001 mg/L

Zn 0.07 mg/L

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Mountain View #1--08/24/90

LAB NO: S2581

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 7.54 SU

Total Metals

As 2170 mg/Kg

Cd 13 mg/Kg

Cu 34 mg/Kg

Fe 19.300 mg/Kg

Pb 794 mg/Kg

Zn 1550 mg/Kg

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Mountain View #2--08/24/90

LAB NO: S2690

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 4.59 SU

Total Metals

As 3090 mg/Kg

Cd 41 mg/Kg

Cu 458 mg/Kg

Fe 19.700 mg/Kg

Pb 665 mg/Kg

Zn 5480 mg/Kg



SITE NAME: ONTARIO MINE/MILL  
DATE: 23-Aug-90

18/1/92

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celsius)	COMMENTS	D.O. (mg/l)	TEMP C°
ADIT #1	7	3.04	405 654.7	5.5	SAMPLE COLLECTED	0.1	4
SEEP (SLW CUMP)	2	3.37	293 432.3	8.3		0.1	
ADIT #2	15	4.53		5.4		2.0	6
STREAM (DOWNGRADIENT)	24	3.54	215 320.6	8.5	SAMPLE COLLECTED, LOCATION AT ROAD WHICH IS NOT DOWNGRAD OF ALL TAILINGS		

SITE NAME: TELEGRAPH MINE  
DATE: 24-Aug-90

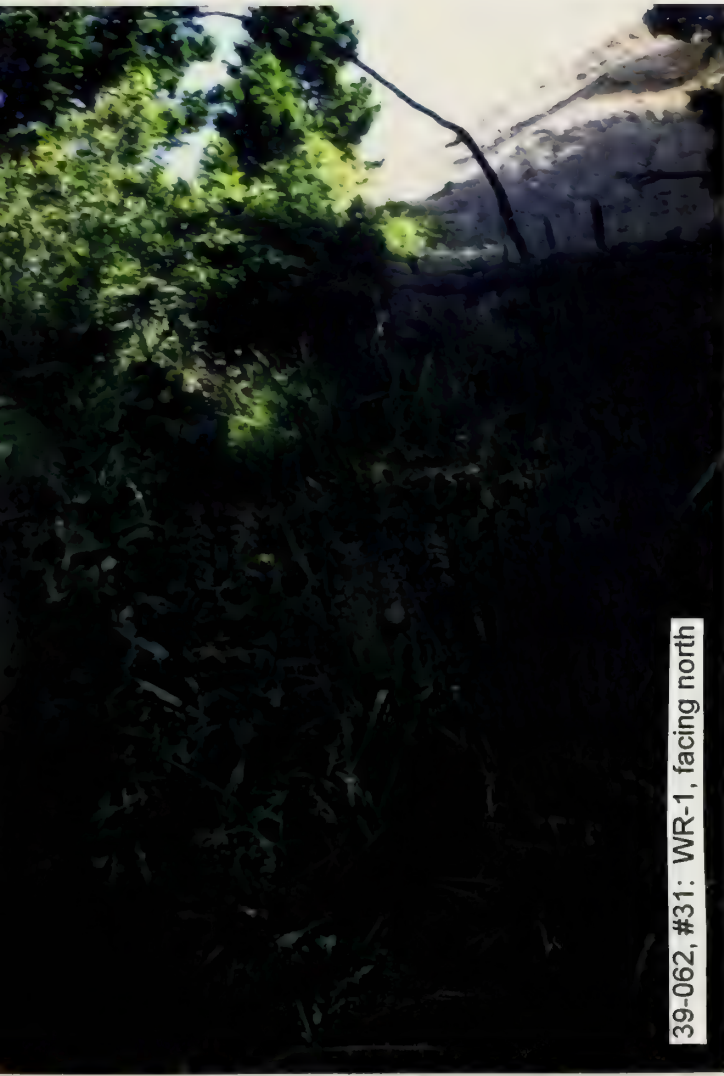
STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celsius)	COMMENTS
ADIT #1	3-5	4.36	189 300.0	6.2	SAMPLE COLLECTED
SEEP (SLW ADIT)	2	5.33	92 137.2	8.5	
SEEP (SLW CUMP)	1-2	3.49	142 219.2	7.2	
STREAM	12	3.71	110 164.7	7.9	SAMPLE COLLECTED, ADIT DISCHARGE AND SEEPS COMBINE AND FLOW TO BRYAN CK
ADIT #2	11	6.53	36 58.2	5.5	

SITE NAME: MOUNTAIN VIEW MINE  
DATE: 24-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celsius)	COMMENTS
ADIT	6	6.94	173 284.7	6.1	SAMPLE COLLECTED
SEEP (SLW CUMP)	1	7.12	155 208.6	12.3	







39-062, #31: WR-1, facing north



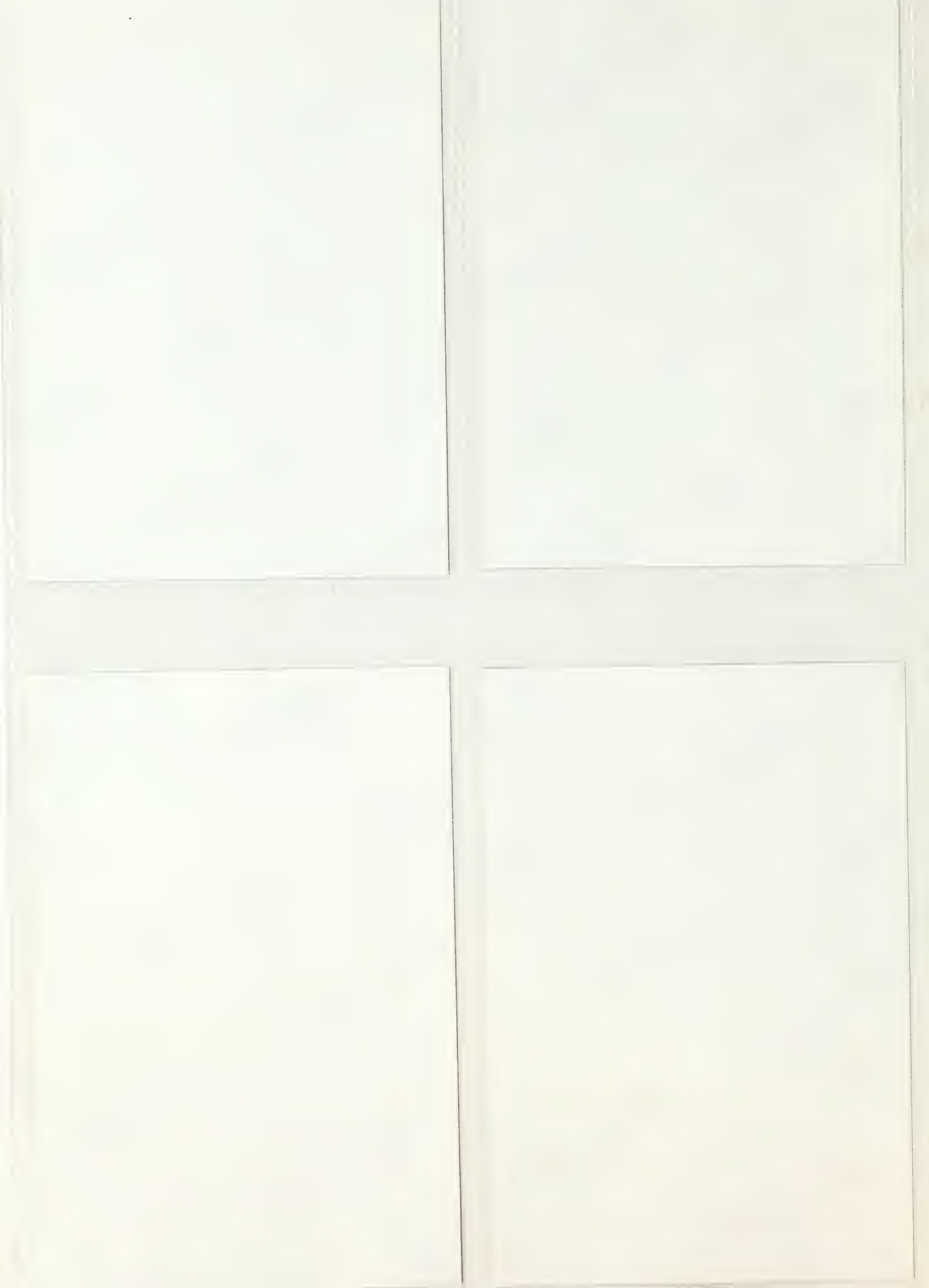
39-062, #32: WR-3 adjacent to Mountain View workings



39-062, #33: TP-1 below mill structure at WR-3



39-062, #34: WR-1 from mill, facing northeast





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: VIKING PA#: 39-077

Date: August 18, 1993 Time: 1600-1900

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Pierson, TD&H  
Belanger, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; warm; cool, wet  
spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #17: Leach area,  
facing west; #18: Leach area, facing north; #19: Leach area, facing  
east; #20: Adit/Cut #1; #21: Adit #2. Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): Former cyanide leach operation has been partially reclaimed.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Close HMO  
(Adit #2). Determine whether groundwater impacts warrant  
additional study and remediation.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): VIKING PA#: 39-077

Legal Description: T 8N ; R 6W ; Sec. 5 , NE 1/4 NE 1/4 1/4

County: POWELL Mining District: ELLISTON

Latitude: N 46° 27' 47" Longitude: W 112° 22' 30"

Primary Drainage Basin and Code: Telegraph Creek/17010201

Secondary Drainage Basin: Booth Gulch

USGS Quadrangle map name(s): Three Brothers and Bison Mountain

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active     , Inactive/Exploration X , Abandoned     .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): USFS; Vern Andrews, Elliston, MT.

Relationship to other mines/sites in the area/district: The Hard Luck and Monarch Mines are the closest sites.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? CN- heap leach pad has been graded and revegetated in the recent past.

General site features: Elevation 6300' , Slope 0°-25° ,  
Aspect North to Northeast

Land use: Mining X , Recreational X , Residential     , Urban     ,  
Agricultural X , Other (Specify)    

Area of disturbed/unvegetated lands? 4 acres.  
Dimensions: Site dimensions are approx. 600 feet x 300 feet.

Predominant vegetation types: Lodgepole pine forest

Access: roads - good     , poor     , 4wd X , trail     .  
Other logistical considerations (proximity to other sites). Booth Gulch Road under a permanent USFS road closure.



Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 3 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site sits on a ridge above perennial  
Telegraph Creek. Water from the site would drain into dry drainage  
to the southeast and would flow to the northeast approx. 1/2 of a  
mile to Telegraph Creek. The site is underlain by quartz  
monzonite. Monitoring well at the site had a SWL of 35' bgs in  
1986. A second monitoring well 65' deep was dry.

Mining/milling history, ore type/tenor, host rock, gangue: Vein in  
quartz monzonite, tourmaline and galena in quartz. Cyanide heap  
leach was used on approx. 3,000 cubic yards of crushed ore to  
extract gold.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , #     , Comment       
Pits - Yes X, No     , # 2, Comment 1 small; 1 - 600'x30'x20'  
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes X, No     . If yes answer the next three  
questions:

Period(s) of Operation: Operation ceased activity in 1908.

Origin of Ore Milled - Custom Mill      Dedicated Mill X; Number and  
names of mines that supplied mill feed:     

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
Formerly heap leach facility (reclaimed); sodium cyanide heap leach  
process used a single heap leach pad and two lined ponds.



Montana Bureau of Mines and Geology  
Water Well Log Data

11/10/1993

Well No.	Location	Depth	Yield	Static Water Level
M:473	08N 06W 05 AA	0.0	0.0	0.00
M:59206	09N 06W 32 AA	105.0	10.0	18.00
M:59207	09N 06W 32 ACDA	31.0	8.0	3.00









SYMBOL	DESCRIPTION
==	CULVERT
*	LIGHT (LIGHT POLE)
Q	UTILITY POLE
•	DECIDUOUS TREE
•	CONIFEROUS TREE
—	WOOD FENCE
—	WIRE FENCE
▨	BUILDING
•	BARRIER POST
∧	GATE
—	EDGE OF ASPHALT
—	EDGE OF GRAVEL
▲	SLOPE DIRECTION
○	TAILINGS POND

# LEGEND

SYMBOL	DESCRIPTION
—	OPEN ADIT
—	COLLAPSED ADIT
—	OPEN SHAFT
—	COLLAPSED SHAFT
○	EXCAVATION
○	WHITE ROCK DUMP
×	COLLAPSED TIMBERS
—	RAILS
⊙	SOIL SAMPLE
⊕	XRF SAMPLE
⊕	WATER SAMPLE
⊕	GROUND AND SURFACE
—	DRAINAGE
●	WATER WELL
—	PONDED WATER
—	VEGETATED WET LANDS

NOT TO SCALE

RECLAIMED AREA APPROXIMATELY 1.8 ACRES  
FORMER HEAP LEACH VOLUME APPROXIMATELY 2000 CU YDS.

THIS AREA HAS BEEN RECLAIMED

WRI

WRI

MONITORING WELL

GRACE ROAD

BACKFILLED TRENCH

SEDIMENT  
RETENTION  
POND

TOP OF HILL

STOCK PILES  
15 CU. YDS. EACH

TIMBERS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

VIKING PA# 39-077  
ELLISTON DISTRICT POWELL COUNTY

SHEET NO.

DRAWN JTP DATE 7 DEC 93  
DESIGNED JPR JOB NO. 93-17  
APPROVED MJB F.B. NO.  
THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

PIONEER  
TDSH



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
Coarse rock and sand from the heap leach \_\_\_\_\_

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Not determined; impossible to auger through rock.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: Study impacts to groundwater.





**SAMPLERS:** Bullock, Pierson

[illegible]

D-Direct reading (Kelvey Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs:

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;  
Number of well logs: 34

Distance to nearest well used for drinking? 1/3 mile on Telegraph Creek

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?  
Definite\_\_\_, Probable X, Possible\_\_\_, Unlikely\_\_\_.  
Historic data indicated CN- contamination.

Other observations/notes: No receptors



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes ☐, No ☒, Name(s): \_\_\_\_\_

Dry streambeds: Yes ☒, No ☐, Name(s): Small intermittent unnamed tributary to Telegraph Creek

Other surface water: Yes ☐, No ☒, Name(s)/Description: \_\_\_\_\_

Waste materials within any floodplain: Yes ☐, No ☒ Source ID(s): \_\_\_\_\_

Approximate Flood frequency? ☐ 1 yr, ☐ 10 yr, ☐ 100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A  
High Flow: \_\_\_\_\_, Average Flow: \_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)? Approx. 1/3 mile

Surface water draining onto or through waste sources: Yes ☐, No ☒,  
Describe: \_\_\_\_\_

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Fishery, stock watering, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes ☐,  
No ☒, Distance downstream (ft)? \_\_\_\_\_ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): \_\_\_\_\_



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH  $\leq$  5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 3 acres on top of hill including  
and adjacent to the reclaimed area

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes\_\_\_, No X, Describe:\_\_\_\_\_

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30 X; 30-100\_\_\_;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? 1/3 mile on Telegraph Creek

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Bullock, Pierson

[illegible]

### Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe:\_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments\_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? "No Trespassing"  
signs; large trenches dug in access road\_\_\_\_\_

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium\_\_\_\_, Low Not Rated

Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low Not Rated

Fisheries Habitat and Species Classification - 4

Sport Fishery Classification - 4

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Adit below the leach pad site\_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 1,  
types and locations: Highwall associated with large partially  
backfilled trench\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



## Bibliography

Great Falls Tribune (Montana), State Orders Clean-up of Viking Mine, January 1, 1986.

MBMG, Metallic Mineral Deposits of Powell County, Montana, Bulletin 98, Written by H.G. McClernan, April 1976.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Viking, Not Inventoried.

MDSL/AMRB Files, Open Pit and Surface Mine Inventory Field Form for Viking, Prepared by Robert Peccia and Associates, October 17, 1990.

Montana Standard (Butte), The, Idle Mine Found to be Health Risk, December 31, 1985.

Northern Engineering and Testing, Viking Mine Heap Leach Water Disposal Plan, November 1, 1986.

USDA, Correspondence and Analytical Results on the Viking Mine, Written to the Helena District Ranger, July 29, 1985.

USGS, Topographic Map, Three Brothers and Bison Mountain, 7 1/2 minute Quadrangles, 1985.



LABORATORY ANALYTICAL DATA

VIKING  
PA NO. 39-077





Viking PA# 39-077  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/18/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-077-WR-1	719 J	51.9 J	2.4 J	17.3 J	8.9 J	128 JX	32500 J	0.038 U	562 J	9 J	796 J	5 U	604 JX	0.32 U
39-077-WR-2	168 J	44.6 J	0.4 U	8.6 J	9.9 J	56.6 JX	18800 J	0.026 U	467 J	9 J	586 J	4 U	194 JX	0.564
BACKGROUND	163	147	0.6 U	9.2	9.3	21.7	35800	0.066 JX	933 J	9	30	8 J	78 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		SULFATE		PYRITIC		ORGANIC		PYRITIC		SULFUR		SULFUR	
	SULFUR %	ACID BASE t/1000	NEUTRAL, POTENT.	ACID BASE POTENT.	SULFUR %	SULFUR %	SULFUR %	ACID BASE t/1000	SULFUR %	SULFUR %	SULFUR %	ACID BASE t/1000	ACID BASE POTENT.	ACID BASE POTENT.	ACID BASE POTENT.	ACID BASE POTENT.
39-077-WR-1	0.04	1.25	5.61	4.36	0.04	0.01	0.01	0	0.01	0.01	0	0	5.61	5.61	5.61	5.61
39-077-WR-2	0.02	0.62	6.03	5.4	0.01	0.01	0	0	0.01	0.01	0	0	6.03	6.03	6.03	6.03

LEGEND

WR1 - Sample of the WR1 subsample.  
WR2 - Sample of the WR2 subsample.  
BACKGROUND - From the Charter Oak Mine (39-003-SS-1).



XRF ANALYSIS RESULTS

VIKING  
PA NO. 39-077





**Mine Name: Viking PA# 39-077**

## XRF Field Analyses

## Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-077-WR-1		24759.4	5482.64	1400.89		823.107 *	27775.1		59.798 *	499.912	552.322	207.469
39-077-WR-1-DUP		25933.3	5515.58	1293.15		867.069 *	28128.2	250.528 *	61.8928 *	534.608		197.895
39-077-WR-2		17426.8	19151.4	2319.91		617.715 *	31677.2			171.411	42.8095 *	395.378
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-077-WR-1	146.512			547.814	203.281			440.3		15.4006 *	19.4455 *	
39-077-WR-1-DUP	148.766			576.616	216.909			445.114		20.3759 *	17.4574 *	
39-077-WR-2	178.962			201.997	167.568			499.598		13.1497 *	20.9682 *	

\* - Estimated Quantity  
 \$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

VIKING  
PA NO. 39-077





# **AIMSS SCORESHEET**

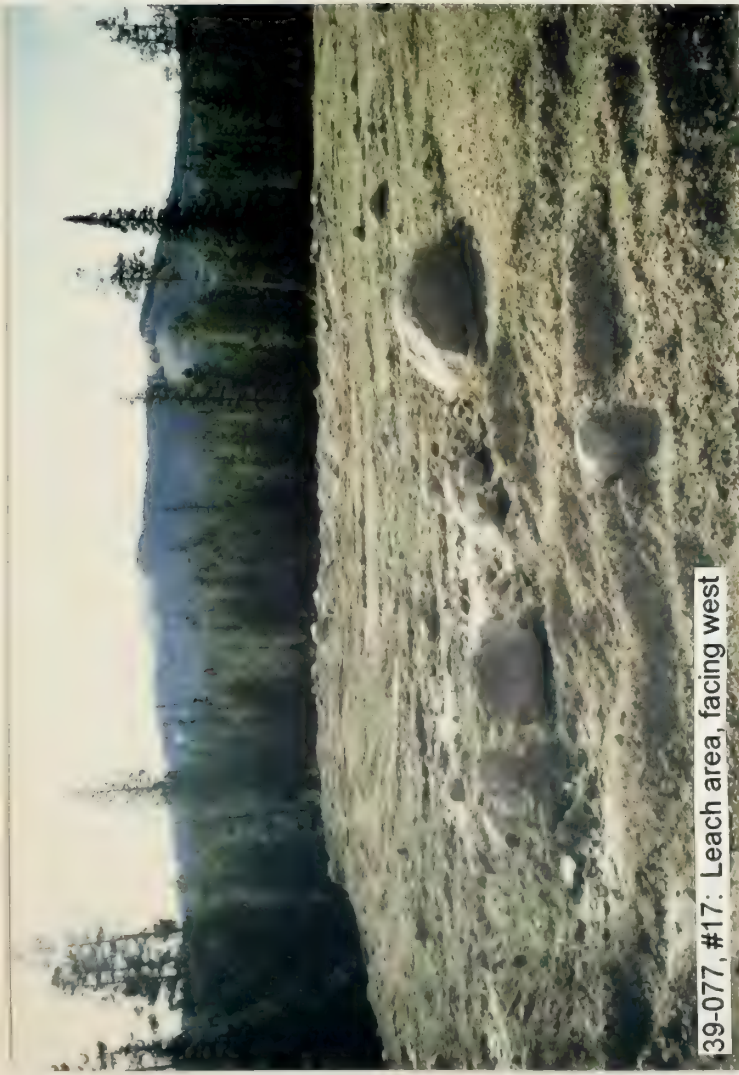
SITE NAME:  
PA NUMBER:

VIKING  
39-077

LINE NO.		GROUNDWATER PATHWAY	PA NUMBER:	39-077
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	40
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	40
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.493
6		WELLS - 1 MI. x 2.5		7.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		31
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	43.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	2598
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.589
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	8
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	508
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		1
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	5
27		LIKELIHOOD SCORE	LINES 25 + 26C	5
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.147
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	7
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	50
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.138
40		POPULATION - 1 MILE		1
41	DIRECT CONTACT TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	1
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	7
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE			
	(LINES 10 + 24 + 35 + 44) / 100,000			0.03

LINE NO.				SITE NAME:	VIKING
				PA NUMBER:	39-077
	<u>SITE SAFETY</u>				
1	THREAT	ACCESSIBILITY			10
2		OPEN SHAFTS	100 EA.		0
3		OPEN ADITS	50 EA.		50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		75
5		HAZ. STRUCTURES	40 EA.		0
6		EXPLOSIVES			0
7		HAZ. MATERIALS			0
8		HAZARDS SCORE	SUM LINES 2 THRU 7		125
9		POPULATION - 1 MILE			1
10	TARGETS	NEAREST RESIDENCE			0
11		RECREATIONAL USE			0
12		TARGETS SCORE	SUM LINES 9 THRU 11		1
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>		<b>1.25</b>





39-077, #17: Leach area, facing west



39-077, #18: Leach area, facing north



39-077, #19: Leach area, facing east



39-077, #20: Adit/Cut #1 (from above)



39-077, #21: Adit #2









MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: EMERY PA#: 39-004

Date: July 16, 1993 Time: 0900-1930

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Mostly cloudy; occasional rain; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1, #2: WR-2; #3-#5: WR-1 from west; #6: Shaft #1 HMO; #7: Shaft #3 HMO; #8: WR-3; #9, #10: WR-1 from east; #11: Adit #1 HMO; #12: WR-6; #13: SW-1 downstream N. Frk.; #14: WR-7; #15: WR-6; #16: WR-5; #17, #18: WR-4; #19: SW-2 upstream N. Frk.; #20: Millsite; #21: WR-12; #22: TP-4; #23: TP-3; #24: TP-2; #25: TP-1; #26: WR-9; #27: WR-10.  
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Site sampled included: 3 shafts, SE (Dumps 1, 2, 3); 2 shafts, N (Dumps 4, 8); 4 adits, N (Paymaster?, Dumps 5, 6, 7); 2 shafts, SW (Dumps 9, 10); 1 adit, SW (Dump 11); mill buildings, central (Dump 12); tailings ponds, central (TP-1, -2, -3, -4).  
Includes: Paymaster claim group and Blue Eye Maggie/Emery group, Carbonate Hill (contiguous); Does not include: Hidden Hand, Argus, Bonanza.  
Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Re-route streams that go through tailings and waste rock dumps or move sources out of floodplain. Revegetate tailings and waste rock dumps. Close HMOs.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): EMERY PA#: 39-004

Legal Description: T 7N ; R 8W ; Sec. 10,11 , 1/4 1/4 1/4

County: POWELL Mining District: EMERY/ZOSELL

Latitude: N 46° 22' 30" Longitude: W 112° 35' 00"

Primary Drainage Basin and Code: Cottonwood/17010201

Secondary Drainage Basin: Rocker Gulch

USGS Quadrangle map name(s): Baggs Creek/Sugarloaf Mountain

Mine Type/Commodities: Hardrock/Gold, Silver, Lead, Zinc  
Activity Status: Active , Inactive/Exploration X , Abandoned .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Bob Little, M. P. M. Ltd., 100 Park Center Building/908 N, Spokane, WA 99201. (509) 326-3443; Robert Cowen, 167 Boulder Road, Deer Lodge, MT 59722-9703. (406) 846-1939; Gordon MacPherson, 3435 SW Hamilton Court, Portland, OR 97201. (503) 246-5771; Ernest Hicks, 2424 Southeast Boulevard, Spokane, WA 99223; William Knop, 510 Maryland, Deer Lodge, MT 59722-1545; D.B. Malcome, 211 Missouri, Deer Lodge, MT 59722; Tammy Koesler, 808 Milwaukee Avenue, Deer Lodge, MT 59722; John Inman, 2211 Sierra Drive, Elko, NV 89801; M.D. Lightfoot, Attn: Marlene Olmstead, 716 Kentucky, Deer Lodge, MT 59722; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Hidden-hand, North; Bonanza, Northeast.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Relatively new exploration activity

General site features: Elevation 6000'-6400' , Slope 5°-25° ,  
Aspect Southeast, West, Southwest

Land use: Mining      , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 11 acres.  
Dimensions: 3,000 feet x 3,000 feet

Predominant vegetation types: Lodgepole/Ponderosa pines

Access: roads - good X , poor , 4wd , trail .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). District is underlain by andesite, a  
formation of probable late Cretaceous age that consists of flows,  
tuffs, and breccias. In the Zoxell district, this formation  
consists chiefly of flows; it is a dark green/gray rock containing  
white amygdules and generally characterized by small, white  
phenocrysts of feldspar. Site lies on both sides and between  
Rocker Gulch and North Fork Rocker Gulch; TP-4 lies at the  
confluence of the two. Rocker Gulch flows 1 mile southwest away  
from the site to Middle Fork Cottonwood Creek, which flows 9 miles  
to the Clark Fork River.

Mining/milling history, ore type/tenor, host rock, gangue: Quartz  
and ankerite, a carbonate of calcium and iron with more or less  
manganese, usually compose the bulk of the filling. The principal  
ore minerals are pyrite, arsenopyrite, sphalerite, and galena.

Mine Operation?

Shafts - Yes X, No    , # 7, Comment 2 open; others collapsed  
Adits - Yes X, No    , # 5, Comment 1 gated; others collapsed  
Pits - Yes    , No X, #    , Comment      
Placers - Yes    , No X, #    , Comment      
Other - Yes    , No X, #    , Comment    

Mill Operation? Yes X, No    . If yes answer the next three  
questions:

Period(s) of Operation: Unknown; newer mill approx. 1970s.

Origin of Ore Milled - Custom Mill X Dedicated Mill X; Number and  
names of mines that supplied mill feed: Most to all patented  
claims surrounding

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
Floatation

Montana Bureau of Mines and Geology  
Water Well Log Data

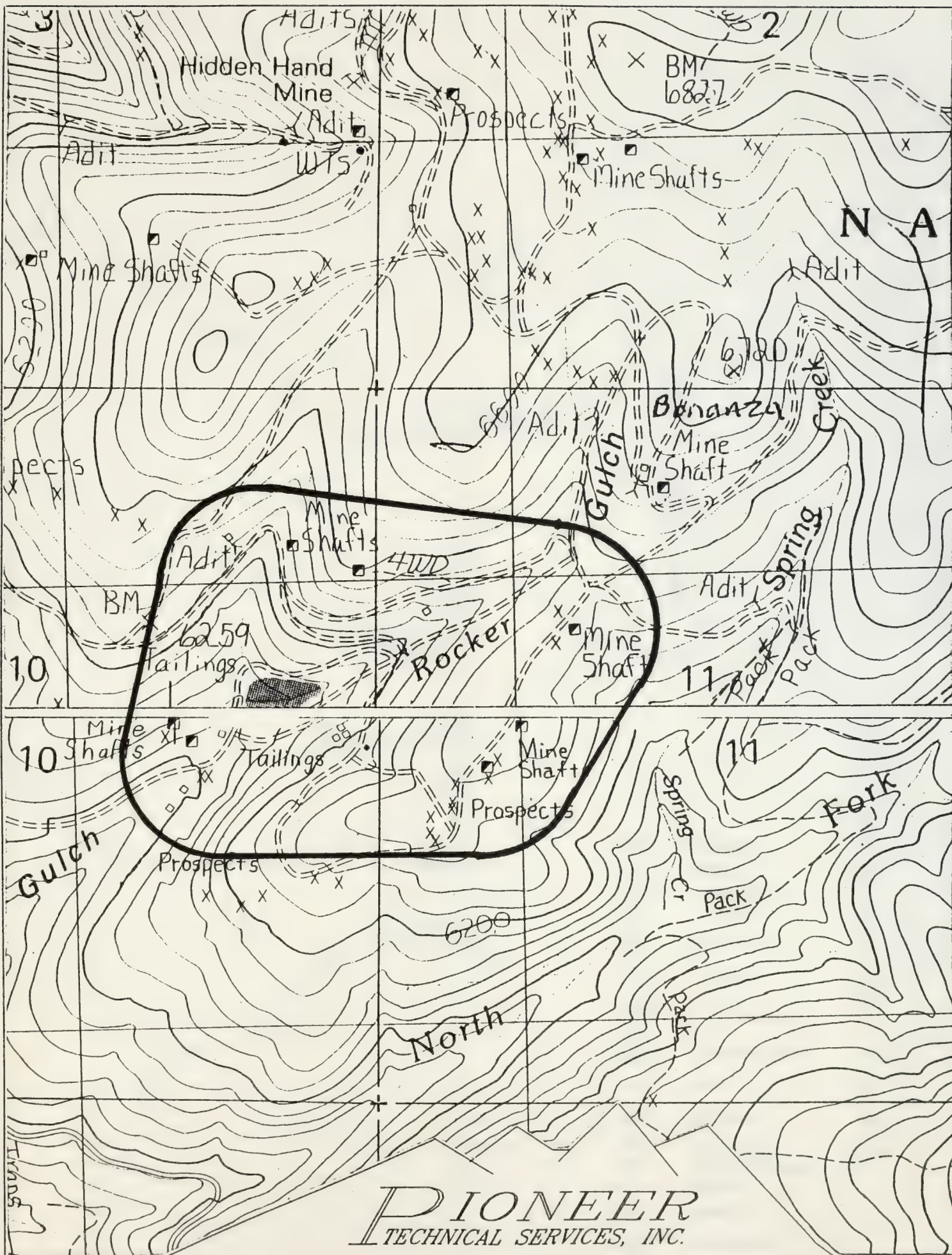
11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:55818	07N 08W 10 BBB	113.0	20.0	67.00
M:55819	07N 08W 10 BCBB	114.0	15.0	0.00









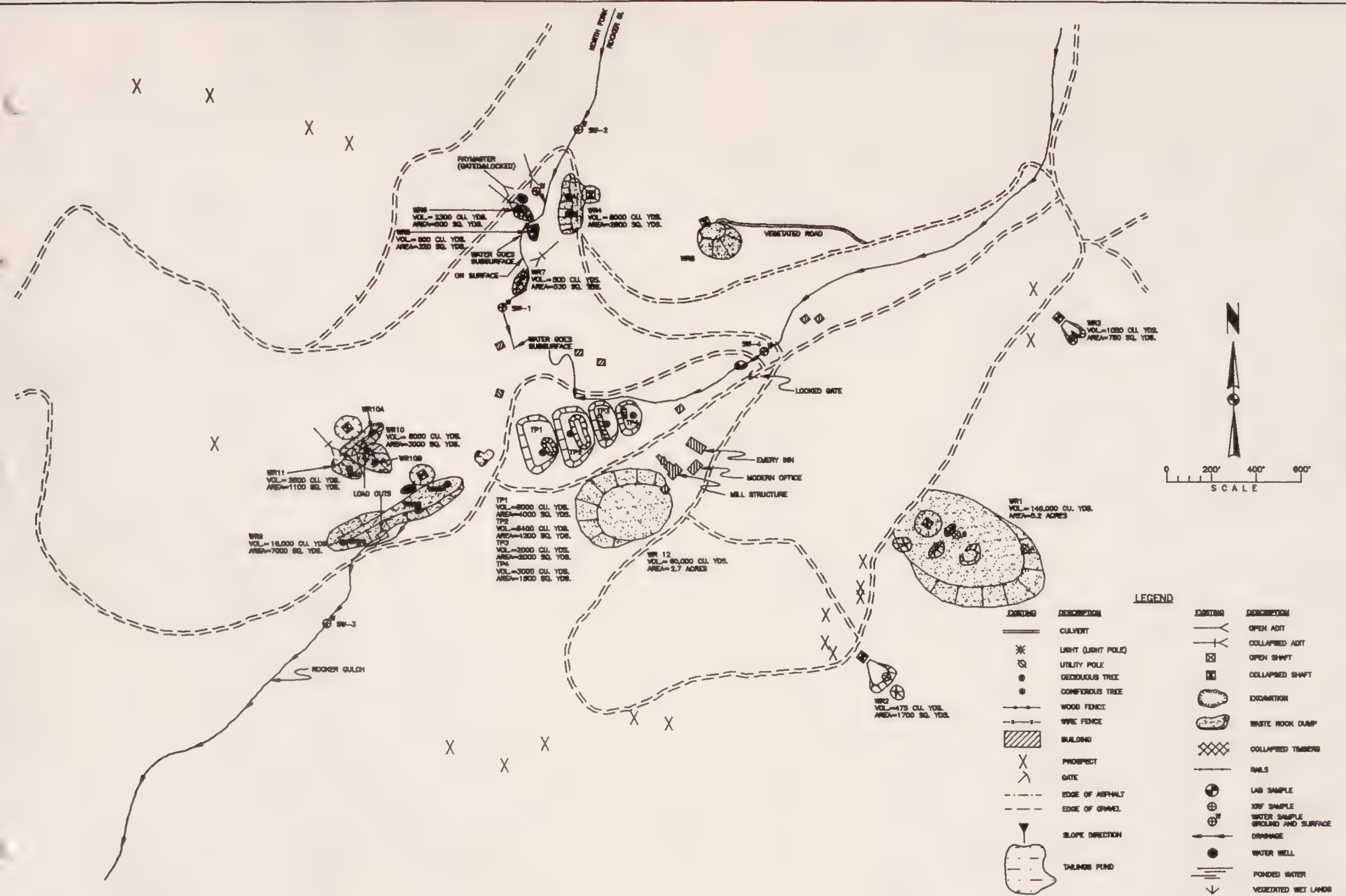
EMERY, P.A. NO. 39-004

T07N, R08W, SECTION 10,11

SCALE: 1" = 1000'







DRAWN: JTP  
 DESIGNED: JTP  
 APPROVED: JLB  
 DATE: 22 NOV 83  
 JOB NO: 93-17  
 F.B. NO:

**PIONEER**  
 ENGINEERING CONSULTANTS  
 GREAT FALLS - BOZEMAN - KALISPELL  
 SPOKANE

MONTANA DEPT. OF STATE LANDS  
 HAZARDOUS MATERIAL INVENTORY  
 EMERY PA# 39-004  
 EMERY DISTRICT POWELL COUNTY

**TD&H**  
 THOMAS, DEAN & HOSKINS INC.  
 ENGINEERING CONSULTANTS  
 GREAT FALLS - BOZEMAN - KALISPELL  
 SPOKANE

SHEET NO.





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
Primarily sand size, some silt/clay (10%).

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Four ponds, depth varies from 3.5 feet to over 12 feet deep; no obvious stratification.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): TP-4 is 50% wet; others dry.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): New dams were constructed out of excavated tailings, but little if any additional tailings added.

Comments on potential for mitigation: Water is diverted around north side of ponds. Water cannot run off ponds due to dikes; partially revegetated naturally.

# SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger, Lasher\*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	145,000	SE part of site, top of ridge; SE of shaft on top	None	5.8 (D)	0.04	39-004-WR-1	07/16/93 2000	T-Metals, ABA
WR-1B	WR		SE part of site, top of ridge; center	None	5.4 (D)	0.05			
WR-2	WR	475	SE part of site, top of ridge; assoc. with collapsed adit	None	5.6 (D)	0.05			
WR-3	WR	1,050	SE part of site, top of ridge; far east, assoc. with open adit	None	4.7 (D)	0.05			
WR-4A	WR	8,000	Paymaster area, NW part of site; assoc. with collapsed shaft	None	6.2 (D)	0.04	39-004-WR-2	07/16/93 2100	T-Metals, ABA
WR-4B	WR		Paymaster area, NW part of site; assoc. with collapsed shaft	None	6.4 (D)	0.04			
WR-5	WR	800	Paymaster area, NW part of site; assoc. with collapsed adit and loadout area in N.F. Rocker Gulch	None	5.0 (D)	0.05			
WR-6	WR	2,300	Paymaster area, NW part of site; assoc. with open adit	None	5.6 (D)	0.05			
WR-7	WR	500	Paymaster area, NW part of site; assoc. with collapsed adit and loadout area in N.F. Rocker Gulch	None	6.0 (D)	0.04			
WR-8	WR	NM	N part of site; assoc. with shaft on hill top	None	6.7 (D)	0.04			
WR-9A	WR	16,000	SW part of site; largest waste rock on N side of Rocker Gulch, assoc. with collapsed shaft	None	6.2 (D)	0.06	39-004-WR-3	07/16/93 2200	T-Metals, ABA
WR-9B	WR		SW part of site; largest waste rock on N side of Rocker Gulch, assoc. with collapsed shaft	None	5.9 (D)	0.05			
WR-9C	WR		SW part of site; largest waste rock on N side of Rocker Gulch, assoc. with collapsed shaft	None	5.4 (D)	0.05			

\*D-Direct reading (Galvey Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 39-004-WR-1 is composite of WR-1A and -1B, WR-2, and WR-3. 39-004-WR-2 is composite of WR-4A and -4B, and WR-5 through -8. 39-004-WR-3 is composite of WR-9A through -9C, WR-10A and -10B, and WR-12A and -12B. NM = Not Measured.

\*Continued on next page



# SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Tuesday, Belanger, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-10A	WR	8,000	W part of site; highest waste rock on N side of Rocker Gulch	None	6.0 (D)	0.04			
WR-10B	WR		W part of site; highest waste rock on N side of Rocker Gulch	None	6.4 (D)	0.05			
WR-11	WR	2,500	Waste rock furthest west on the N side of Rocker Gulch; next to WR-10	None	6.0 (D)	0.03	N/A	N/A	XRF Analysis
WR-12A	WR	60,000	S part of site; waste rock next to mill	None	6.0 (D)	0.04			
WR-12B	WR		S part of site; waste rock next to mill	None	6.0 (D)	0.04			
TP-1A	TAIL	8,000	SE 1/4 of TP-1; 1'-3.5', rust/yellow sand	Fair	5.2 (D)	0.04	39-004-TP-1	07/16/93 2100	T-Metals, ABA
TP-1B	TAIL		SE 1/4 of TP-1; 3.5'-6', gray sand/clay	Fair	4.9 (D)	0.04			
TP-2	TAIL	8,400	Near center of TP-2; 0'-10', gray/green/tan sand	Fair	3.8 (D)	0.04			
TP-3	TAIL	2,000	Near center on W edge; 0'-3.5', gray/green/tan sand/clay	Fair	4.0 (D)	0.04			
TP-4	TAIL	3,000	Near center of TP-4; 0'-6', tan/gray sand	Fair	3.7 (D)	0.04			
SS-1	BKGRND	N/A	Background soil	N/A	N/A	N/A	39-004-SS-1	07/16/93	T-Metals

D-Direct reading (Kilovolt Meter); S-Saturated Paste (Oxion Meter)

Comments or deviations from SOPs: 39-004-TP-1 is composite of TP-1A and -1B, -2, -3, and -4.  
NM = Not Measured.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 1 Identification: Adit #1

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes X, No    , Number:     Identification: Above  
Paymaster area in North Fork Rocker Gulch

Groundwater wells within 4 miles?: Yes X, No    ;  
Number of well logs: 24

Distance to nearest well used for drinking? Mine well on-site, but is abandoned.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable    , Possible X, Unlikely    .

Many dumps and tailings ponds located in floodplain; dumps and tailing contain elevated metal values.

Other observations/notes: N/A



**SAMPLERS:** Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No     , Name(s): Rocker Gulch and North Fork Rocker Gulch

Dry streambeds: Yes     , No X , Name(s):    

Other surface water: Yes     , No X , Name(s)/Description:    

Waste materials within any floodplain: Yes X , No     Source ID(s): TP-1 through -4; WR-4 through -7, and -9

Approximate Flood frequency? X 1 yr,     10 yr,     100 yr

Estimated seasonal flow of stream(s) (cfs)? 15 gpm during sampling  
High Flow: 90 gpm , Average Flow: 12 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes     , No X ,  
Describe:    

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Wetland, irrigation; Clark Fork River has fishery, recreation, and wetlands.

Observed erosional/sedimentation/stream turbidity problems? Yes     ,  
No X , Distance downstream (ft)?     Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):      
N/A



# SURFACE WATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm e 25°C	Eh mV	Temp °C	ALK. mg/L as CaCO <sub>3</sub>	Flow cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downstream N. Frk. Rocker Gulch	8.23	200	187	9.8	57	10 gpm (E)	39-004-SW-1	07/16/93	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-1	SE	Downstream N. Frk. Rocker Gulch	N/A	N/A	N/A	N/A	N/A	N/A	39-004-SE-1	07/16/93	T-Metals
SW-2	SW	Upstream N. Frk. Rocker Gulch	8.10	130	174	14.6	30	10 gpm (E)	39-004-SW-2	07/16/93	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-2	SE	Upstream N. Frk. Rocker Gulch	N/A	N/A	N/A	N/A	N/A	N/A	39-004-SE-2	07/16/93	T-Metals
SW-3	SW	Downstream Rocker Gulch	8.35	510	NM	9.8	108	15 gpm (E)	39-004-SW-3	07/16/93	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-3	SE	Downstream Rocker Gulch	N/A	N/A	N/A	N/A	N/A	N/A	39-004-SE-3	07/16/93	T-Metals
SW-4	SW	Upstream Rocker Gulch	7.70	310	NM	7.4	73	12 gpm (E)	39-004-SW-4	07/16/93	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-4	SE	Upstream Rocker Gulch	N/A	N/A	N/A	N/A	N/A	N/A	39-004-SE-4	07/16/93	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FeOX)

Presence of burned or stressed vegetation? (VEG)

pH  $\leq$  5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 10 to 20 acres

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes , No X , Describe:

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30 X; 30-100\_\_\_;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? 1.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger\*

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PAST/ALL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/NO DUST/LOW/NONE)
WR-1	FeOx; Pyrite	Dry	226,500	226,500	Yes	Moderate
WR-2	FeOx	Dry	15,300	15,300	Yes	Moderate
WR-3	FeOx; Pyrite; pH	Dry	6,750	5,400	Yes	Moderate
WR-4	FeOx	Dry	25,200	22,680	Yes	Moderate
WR-5	FeOx; Sulfides	Dry	2,880	2,592	Yes	Moderate
WR-6	FeOx	Dry	4,500	4,050	Yes	Moderate
WR-7	FeOx	Dry	4,770	4,770	Yes	Moderate
WR-8	FeOx	Dry	NM	100%	Yes	Low
WR-9	FeOx	Dry	63,000	63,000	Yes	Low
WR-10	FeOx	Dry	27,000	27,000	Yes	Low
WR-11	FeOx	Dry	9,900	7,920	Yes	Low
WR-12	FeOx; Sulfides	Dry	117,600	117,600	Yes	Low

Notes and Clarifications: \*Continued on next page

## ACID DRAINAGE/AIR PATHWAY INVENTORY FORM (Cont'd)

**SAMPLERS:** Tuesday, Belanger

[illegible]

### Notes and Clarifications:

## Bibliography

MBMG, Sampling and Analysis Plan and Analytical Data for Emery Mine, Provided by Ted Duaime, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

USGS, Geology and Ore Deposits of the Butte District, Montana, Professional Paper 74, Written by W.H. Weed, 1912, pp. 27-28.

USGS, Topographic Map, Baggs Creek and Sugarloaf Mountain, Montana, 7 1/2 Quadrangles, 1989.



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: Recently occupied cabins on-site; possible workers.

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe:\_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Fenced and  
signed (tailings ponds and mill area, and WR-12) only.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
T&E Species Habitat - Yes X, No\_\_\_\_, Comment Bald Eagle  
Bat Habitat - Yes\_\_\_\_, No X, Comment\_\_\_\_\_

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 3  
Sport Fishery Classification - 4

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 3, types and locations:\_\_\_\_  
Two shafts and one adit

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 2,  
types and locations: Numerous fresh trenches in area.

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number All, types and locations: All waste piles at angle of repose.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



LABORATORY ANALYTICAL DATA

EMERY  
PA NO. 39-004



Emery PA# 39-004  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 07/16/93

SOLID MATRIX ANALYSES

Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-004-SE-1	318	49.5	5.7	15.8	39.5	28.6	38500	0.151	970	18	645	6 UJ	957	NR
39-004-SE-2	157	110	2.9	17.1	32.1	26.1	45400	0.15	1210	8	141	8 UJ	247	NR
39-004-SE-3	454	77.2	5.5	20.2	43.7	29.5	47700	0.182	1010	14	303	7 UJ	1020	NR
39-004-SE-4	390 J	159 J	7	42.7 JX	60.3 JX	64.4 J	89900 J	0.457	2540 J	46 J	462	19 UJ	620 JX	NR
39-004-TP-1	6480 J	39.1 J	17.1	12.5 JX	29.3 JX	226 J	43000 J	0.363	3030 J	19 J	1560	65 J	2070 JX	NR
39-004-WR-1	12900 J	162 J	87.2	23.8 JX	14.5 JX	472 J	81600 J	1.56	8080 J	29 J	9230	564 J	9910 JX	NR
39-004-WR-2	6080 J	14.5 J	34	20.1 JX	33.5 JX	175 J	61300 J	1.14	3780 J	81 J	5980	32 J	2070 JX	NR
39-004-WR-3	3630 J	477 J	56.3	21.2 JX	27.6 JX	313 J	45300 J	0.785	11600 J	13 J	1970	126 J	4490 JX	NR
BACKGROUND	91	295	3.5	13.9	36.9	67.3	43400	0.165	2960	7	43	7 UJ	171	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE t/1000	NEUTRAL POTENT. t/1000	SULFUR ACID BASE POTENT. t/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. t/1000	SULFUR ACID BASE POTENT. t/1000
39-004-TP-1	1.44	45	90.6	45.6	0.27	1.24	38.7	51.9
39-004-WR-1	4.5	141	51	-89	1.54	2.1	65.6	-14.6
39-004-WR-2	2.34	73.1	94.3	21.2	0.59	0.98	30.6	63.7
39-004-WR-3	3.04	95	124	28.6	0.9	1.44	45	78.6

WATER MATRIX ANALYSES

Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	CALC.
39-004-SW-1	15.5	7.43	3.63 J	9.7 U	6.83 U	1.6	152	0.038 U	13.1	12.7 U	10.7	30.7 U	54.5	70.6
39-004-SW-2	12.6	8.73	3.13 J	9.7 U	6.83 U	1.55 U	411	0.038 U	29	12.7 U	2.88	30.7 U	7.57 U	42.7
39-004-SW-3	92.4	11.2	3.9 J	9.7 U	6.83 U	1.55 U	152	0.250	11.9	12.7 U	6.76	30.7 U	32.3	214
39-004-SW-4	8.61	10	2.6 J	9.7 U	6.83 U	1.55 U	21.7	0.052	4.08 U	12.7 U	1.61	30.7 U	7.57 U	111

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
39-004-SW-1	123	< 5.0	21	< 0.05	NR
39-004-SW-2	83	< 5.0	12	< 0.05	NR
39-004-SW-3	305	< 5.0	114	< 0.05	NR
39-004-SW-4	179	< 5.0	46	< 0.05	NR

LEGEND

- SE1 - Downstream N. Fork Rocker Gulch.  
SE2 - Upstream N. Fork Rocker Gulch.  
SE3 - Downstream Rocker Gulch.  
SE4 - Upstream Rocker Gulch.  
TP1 - Composite of subsamples TP1a, 1B, 2, 3, and 4.  
WR1 - Composite of subsamples WR1A, 1B, 2, and 3.  
WR2 - Composite of subsamples WR4A, 4B, 5, 6, 7, and 8.  
WR3 - Composite of subsamples WR9A, 9B, 9C, 10A, 10B, 12A, and 12B.
- BACKGROUND - From the Emery Mine (39-004-SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Same as sample SE3.  
SW4 - Same as sample SE4.





**XRF ANALYSIS RESULTS**

**EMERY  
PA NO. 39-004**



XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-004-SS-1			13192.6	2435.76		3528.81	41661.4		126.835 *	255.555	190.241	263.912
39-004-TP1-A			14915.1	2263.32		4291.18	39630.1		104.999 *	1667.53	4997.32	190.54
39-004-TP1-B			31321.8	2701.56		2698.53	33463.6	514.128 *	232.14	1455.81	12097.6	190.538
39-004-TP-1-COMP			25075.4	2486.01		4033.61	35519.1			1557.03	4149.43	222.056
39-004-TP-2			33181.7	2961.5		4983.54	44042.7	472.677 *	107.558 *	2437.1	3072.75	274.367
39-004-TP-3			28045	2456.48		3049.83	33380.5		153.871 *	1124.26	6329.62	212.935
39-004-TP-4			18875.5	2034.85	254.884 *	4589.35	40463.2	340.475 *	176.079 *	1959.13	3481.68	191.85
39-004-WR10-A			37806.9	1535.11		8247.44	51759.1		87.5699 *	2637.94	4544.65	362.848
39-004-WR10-B			25752	1605.78		9930.14	52401.9		123.407 *	3210.37	5680.69	250.741
39-004-WR12-A			26723.6	2226.04		5339.33	51333.7		131.413 *	3261.58	4980.25	220.135
39-004-WR12-B			20698.2	2435.67		3184.26	52186.4		268.023	7687.57	5549.48	388.245
39-004-WR1-A		8795.85	29666.8	974.818	167.023 *	12618.6	65016.4		256.398	10692.2	7026.2	262.023
39-004-WR1-B		16538.4	27159.2	1550.78		7036.26	57221.5		352.446	8630.11	8162.04	165.3
39-004-WR4-A			44957.2	1295.31	156.17 *	4360.63	45108.6		58.032 *	3239.42	4453.3	218.38
39-004-WR4-B			40453.7	1485.61	208.516 *	3652.31	47140.4			1329.74	1597.74	261.052
39-004-WR9-A			33357.1	1265.9	201.066 *	12482.5	45723.4		61.3905 *	1810.91	2549.22	402.159
39-004-WR9-B			7005.78	1626.49		4858.83	67089.5		58.8197 *	682.329	5717.47	322.59
39-004-WR9-C			28135.7	1120.18		9779.14	46951.1			2053.02	5637.41	288.502
39-004-WR-11			31951.3	1403.77		6174.61	84286.2			213.757	215.176	296.466
39-004-WR-1-COMP			22257.9	1422.12		10131	73731.6		384.342	6531.85	10446.9	335.839
39-004-WR-2			6416.91	1533.64		12574.2	94591.7		680.535	4529.65	11468.8	137.084
39-004-WR-2-COMP			14287.4	1008.51		6555.2	95444.8		280.466 *	3101.86	9175.59	126.961
39-004-WR-3			17788.1	1196.2		4492.61	76259		213.108 *	8761.1	18196.8	83.1232
39-004-WR-3-COMP			28398.3	1760.43	147.738 *	6170.88	56975.2		114.181 *	3365.78	5151.21	275.292
39-004-WR-5			22727.5	970.908		786.95 *	104529		305.379	1839.69	12580.7	130.547
39-004-WR-6			4447.04	716.261		4867.89	132162		411.969	2662.34	18600	75.3748
39-004-WR-7			4235.46	1151.16		8758.52	98699.2		326.432	6192.86	3155.12	91.4581
39-004-WR-8			5649.13	795.52		17747.1	103752		219.131 *	7241.21	5438.15	77.5425

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
39-004-SS-1	192.294			54.4009 *	75.6683			634.169			
39-004-TP1-A	145.968			860.316	99.7657		119.81 *	398.15	165.916 *		
39-004-TP1-B	125.834			616.998	96.884			320.371	116.7 *		
39-004-TP-1-COMP	130.604			944.683	100.296		151.101 *	373.845	103.265 *		9.09684 *
39-004-TP-2	151.307			1372.79	114.255		278.23	466.808	118.02 *		
39-004-TP-3	138.516			1020.62	105.175		150.183 *	388.72			
39-004-TP-4	130.333			1535.3	101.646		300.475	423.802	171.955 *		
39-004-WR10-A	120.39			1220.03	57.1716		228.21	664.758	176.206 *		
39-004-WR10-B	138.603			2217	89.9869		391.995	472.035	179.697 *		
39-004-WR12-A	146.953			2402.37	108.665		305.659	455.627	133.262 *		
39-004-WR12-B	154.086			3946.69	106.323	300.741 *	562.303	638.768	193.174 *		
39-004-WR1-A	103.465			2767.19	63.0589		216.917	498.299	141.79 *		
39-004-WR1-B	123.101			5842.02	106.928	180.199 *	985.385	414.609	208.162 *		
39-004-WR4-A	76.1149			2319.02	82.5394	157.117 *		77.5482	121.114 *		
39-004-WR4-B	104.167			796.35	91.6234			167.077	137.494 *		
39-004-WR9-A	122.114			461.684	64.5287		66.0707 *	868.4			
39-004-WR9-B	153.249			970.041	71.2085		255.919	546.344	130.106 *		
39-004-WR9-C	105.854			1276.23	78.8964		507.043	388.962	144.259 *		
39-004-WR-11	121.5			33.9776 *	73.7375			358.312			
39-004-WR-1-COMP	123.8			4985.36	106.189		633.196	461.748	259.277 *		
39-004-WR-2	149.581			6963.42	138.765	287.08 *	1243.77	375.751	178.213 *		
39-004-WR-2-COMP	101.283			7326.3	90.8966			139.205	191.94 *		
39-004-WR-3	83.0382			8857.94	92.7252		133.709 *	136.099	145.73 *		
39-004-WR-3-COMP	141.836			2066.64	87.1466	211.452 *	358.589	546.826	114.757 *		
39-004-WR-5	103.627			7519.26	109.655		123.882 *	105.788	272.23 *		
39-004-WR-6	85.415			13912.3	93.6106 *		143.128 *	61.9575 *	270.129 *		
39-004-WR-7	95.5818			8677.6	112.782	228.395 *		248.553	179.873 *		
39-004-WR-8	80.56			9829.02	99.0652	194.246 *	88.4076 *	163.321	198.091 *		

\* - Estimated Quantity  
 \$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

EMERY  
PA NO. 39-004



# AIMSS SCORESHEET

SITE NAME:  
PA NUMBER:

EMERY  
39-004

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2636.952
6		WELLS - 1 MI. x 2.5		5.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		22
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	27.0
10		<b>GROUNDWATER SCORE</b>	LINES 4 x 5 x 9	28479082
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2750.483
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	27
24		<b>SURFACE WATER SCORE</b>	LINES 14 x 15 x 23	59410433
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	30.873
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	25
35		<b>AIR PATHWAY SCORE</b>	LINES 27 x 28 x 34	57887
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	29.604
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	5
44		<b>DIRECT CONTACT SCORE</b>	LINES 38 x 39 x 43	14802
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b> (LINES 10 + 24 + 35 + 44) / 100,000			879.62

LINE NO.				SITE NAME:	EMERY
				PA NUMBER:	39-004
		<b>SITE SAFETY</b>			
1	THREAT	ACCESSIBILITY			10
2		OPEN SHAFTS	100 EA.		200
3		OPEN ADITS	50 EA.		50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		150
5		HAZ. STRUCTURES	40 EA.		0
6		EXPLOSIVES			0
7		HAZ. MATERIALS			0
8		HAZARDS SCORE	SUM LINES 2 THRU 7		400
9		POPULATION - 1 MILE			0
10	TARGETS	NEAREST RESIDENCE			0
11		RECREATIONAL USE			5
12		TARGETS SCORE	SUM LINES 9 THRU 11		5
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>		<b>20.00</b>



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

LAB ID      SAMPLE ID      Cr    Crq      Ni    Nic    Niq      Cu    Cuc    Cuq      Zn    Znc    Znq      As    Asc    Asq      Ag    Agc    Agq

OLD DOMINION MINE

This site was visited, but no samples were collected.

EMERY MINE

DISSOLVED METALS: (ppb)

92Q853      DDBS10L      0    U      2.65    B      0    U      0    U      112.92      0    U

BULLION MINE & JACK CREE K TAILINGS

DISSOLVED METALS: (ppb)

92Q339	BBUS10M	0	U	5.43	B	44.77	B	1968	1.44	B	0	U
92Q421	BBUS10M	0	U	5.2	B	39.16	B	1892.3	0.93	B	0	U
92Q338	BBUS20L	0	U	0	U	3.62	B	12.34	4.83	B	0	U
92Q418	BBUS20L	1.18	B	0	U	4.42	B	23.57	6.61	B	0.64	B
92Q337	BBUS30M	0	U	0	U	21.66	B	373.25	2.56	B	0	U
92Q419	BBUS30M	0	U	0	U	22.83	B	364.97	2.83	B	0	U
92Q309	BBUS40L	0	U	0	U	4.89	B	31.73	2.22	B	0	U
92Q414	BBUS40L	1.54	B	0	U	4.27	B	28.33	2.89	B	0	U
92Q308	BBUS50H	2.45	B	41.49	B	4698		28230	166.22		0	U
92Q316	BBUS60M	0	U	4.99	B	71.92		2216	1.3	B	0	U
92Q413	BBUS60M	0	U	7.64	B	141.2		2685	1.72	B	0	U
92Q317	BBUS70M	0	U	0	U	0	B	12.96	2.34	B	0	U
92Q315	BBUS80L	0	U	0	U	2.51	B	17.03	1.23	B	0	U
92Q415	BBUS80L	0	U	0	U	0	B	6.04	1.35	B	0	U
92Q318	BBUS90M	0	U	0	U	0	B	6.71	0.92	B	0	U
92Q420	BBUS90M	0	U	0	U	0	U	11.5	1.11	B	0	U
92Q416	BBUSA0M	0	U	0	U	0	B	8.65	1.58	B	0	U
92Q340	BBUSA0M	0	U	0	U	0	U	5.53	1.35	B	0	U
92Q417	BBUSB0L	0	U	0	U	24.86	B	413.58	3.18	B	0	U
92Q341	BBUSB0L	0	U	1.42	U	27.37	B	442.75	3.11	B	0	U
92Q314	BBUSC0L	0	U	0	U	0	U	2.83	0	U	0	U
92Q319	BBUSD0L	0	U	0	U	0	U	4.41	0	U	0	U
92Q310	BBUSTRP	0	U	2.32	U	0	U	23.01	0	U	0	U

# OLD DOMINION MINE

**This site was visited, but n**

## EMERY MINE

DISSOLVED METALS: (ppb)		
92Q853	DBS10L	0 U
		11.29 B
		0 U

**BULLION MINE & JACK CREE**

DISSOLVED METALS: (ppb)									
92Q339	BBUS10M	22.71	18.64	B	0.5	B	0.07	B	
92Q421	BBUS10M	20.25	14.8	B	0	U	0.05	B	
92Q338	BBUS20L	0	10.1	B	0.94	B	0.05	B	
92Q418	BBUS20L	0	14.57	B	0.82	B	0	U	
92Q337	BBUS30M	3.98	15.64	B	0	U	0.1	B	
92Q419	BBUS30M	3.83	18.74	B	0	U	0	U	
92Q309	BBUS40L	0	19.87	B	1.21	B	0.14	B	
92Q414	BBUS40L	0	23.19	B	1.4	B	0	U	
92Q308	BBUS50H	397.32	20.27	B	167.58		0.14	B	
92Q316	BBUS60M	20.55	14.05	B	0.53	B	0.12	B	
92Q413	BBUS60M	74.49	25.57	B	1.05	B	0	U	
92Q317	BBUS70M	0	41.37	B	0	U	0.12	B	
92Q315	BBUS80L	0	34.95	B	0	U	0.19	B	
92Q415	BBUS80L	0	44.64	B	0.72	B	0	U	
92Q318	BBUS90M	0	31.24	B	0	U	0.15	B	
92Q420	BBUS90M	0	35.92	B	0	U	0	U	
92Q416	BBUSA0M	0	42.33	B	0	U	0	U	
92Q340	BBUSA0M	0	37.49	B	0	U	0.15	B	
92Q417	BBUSB0L	4.45	22.14	B	0	U	0	U	
92Q341	BBUSB0L	4.64	18.75	B	0	U	0.07	B	
92Q314	BBUSC0L	0	4.61	B	0	U	0.12	B	
92Q319	BBUSD0L	0	0	U	0	U	0	U	
92Q310	BBUSTRP	0	0	U	0.55	B	0.05	B	



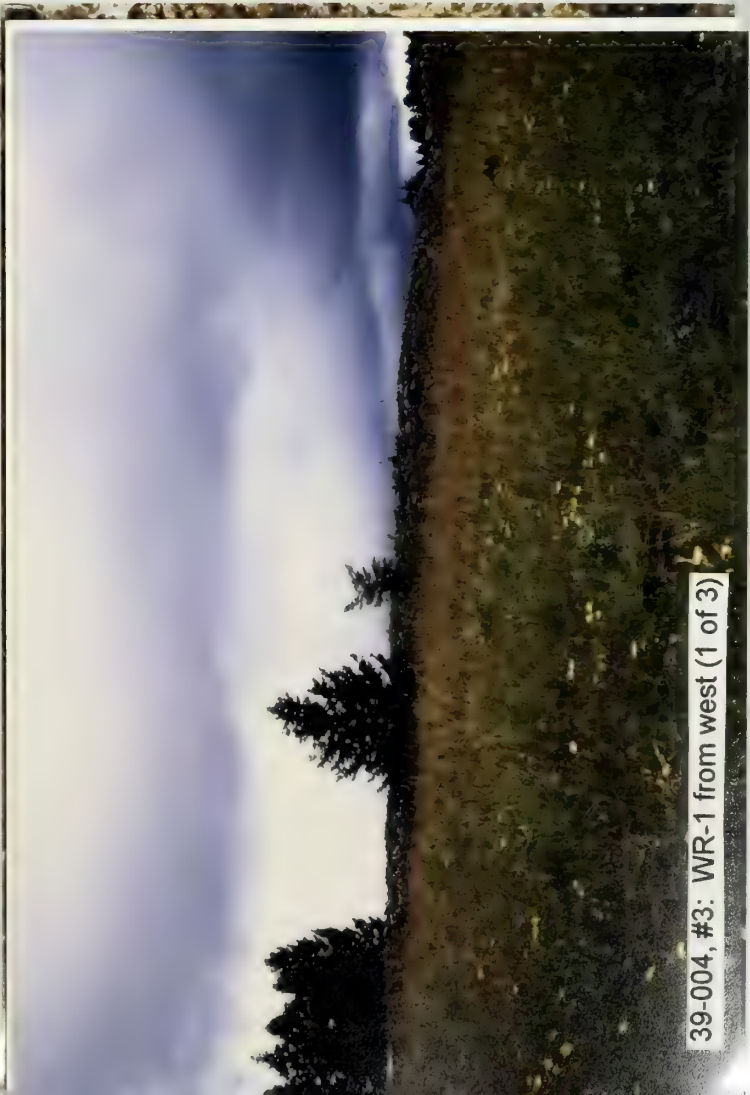




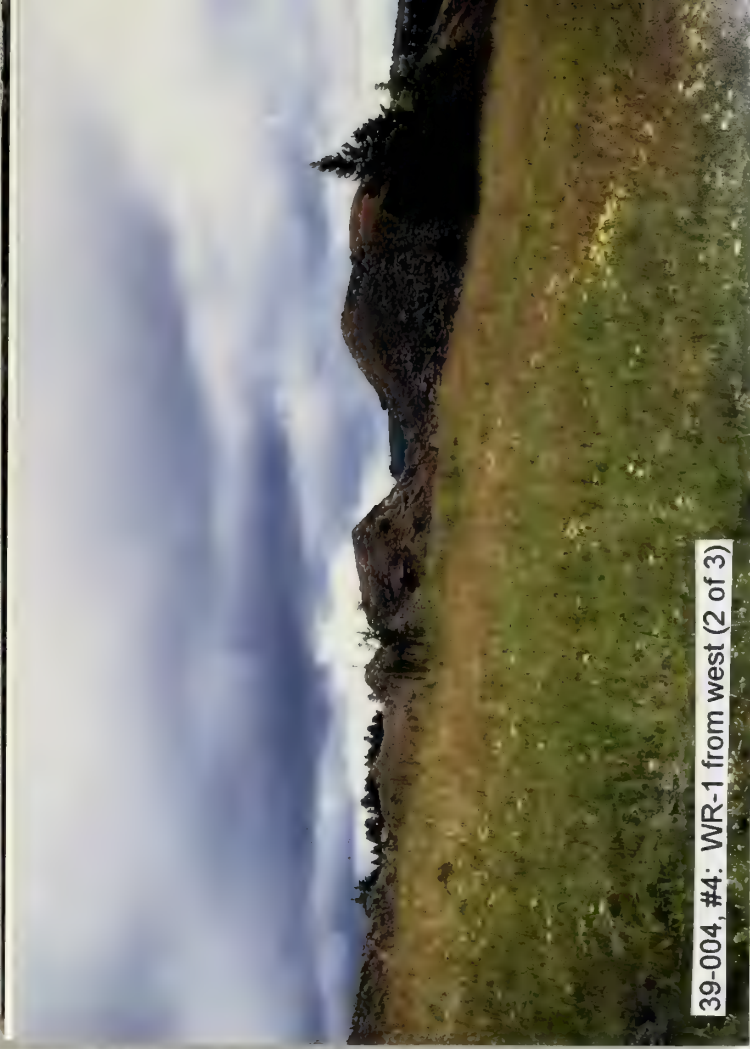
39-004, #1: WR-2



39-004, #2: WR-2



39-004, #3: WR-1 from west (1 of 3)



39-004, #4: WR-1 from west (2 of 3)





39-004, #5: WR-1 from west (3 of 3)



39-004, #6: Shaft #1 (HMO)



39-004, #7: Shaft #3 (HMO)



39-004, #8: WR-3

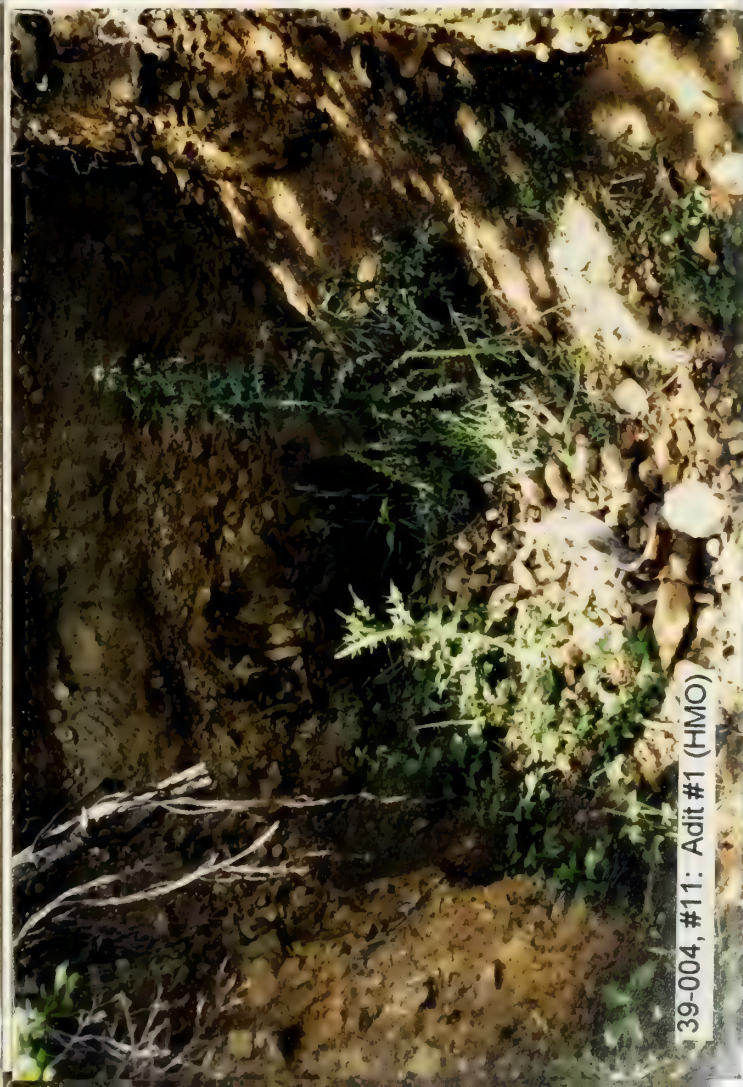




39-004, #9: WR-1 from east (1 of 2)



39-004, #10: WR-1 from east (2 of 2)



39-004, #11: Adit #1 (HMO)

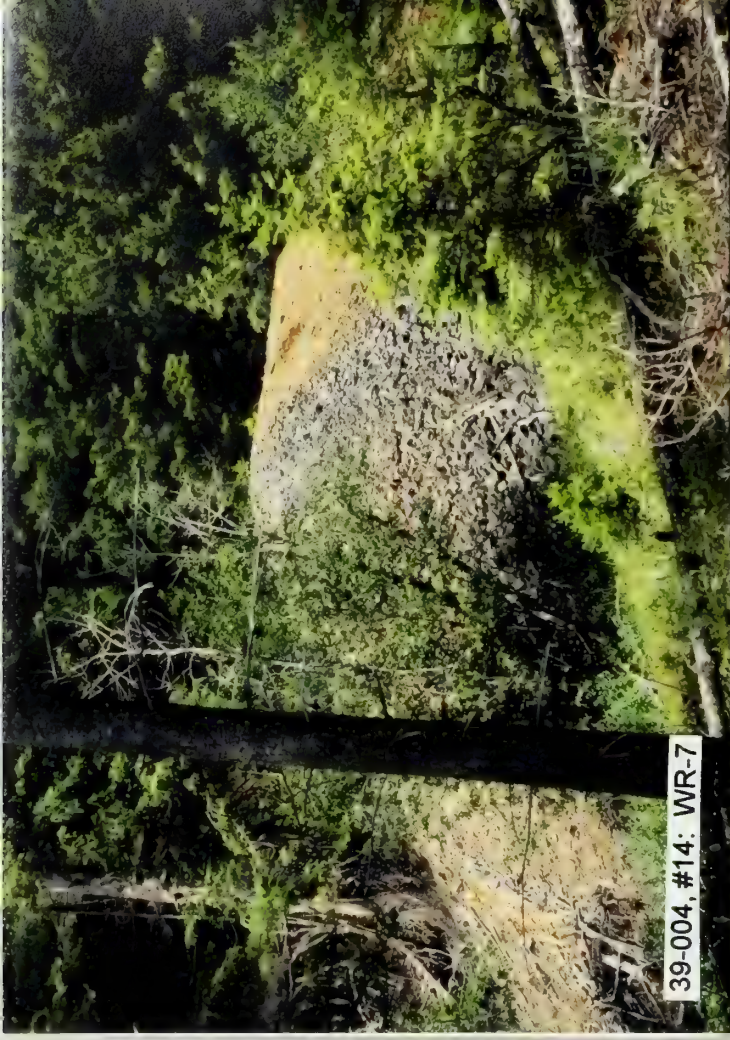


39-004, #12: WR-6





39-004, #13: SW-1 sample location downstream of the North Fork Cottonwood Creek



39-004, #14: WR-7



39-004, #15: WR-6



39-004, #16: WR-5





39-004, #17: WR-4



39-004, #18: WR-4



39-004, #19: SW-2 sample location upstream of the North  
Fork Cottonwood Creek



39-004, #20: Millsite





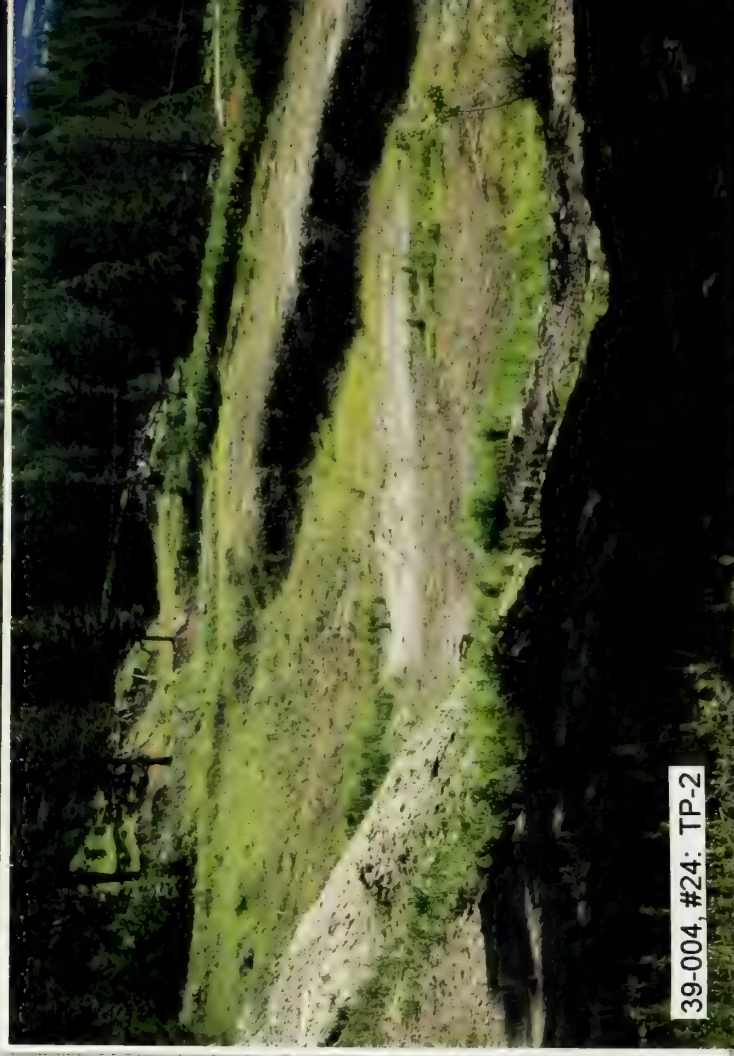
39-004, #21: WR-12



39-004, #22: TP-4



39-004, #23: TP-3

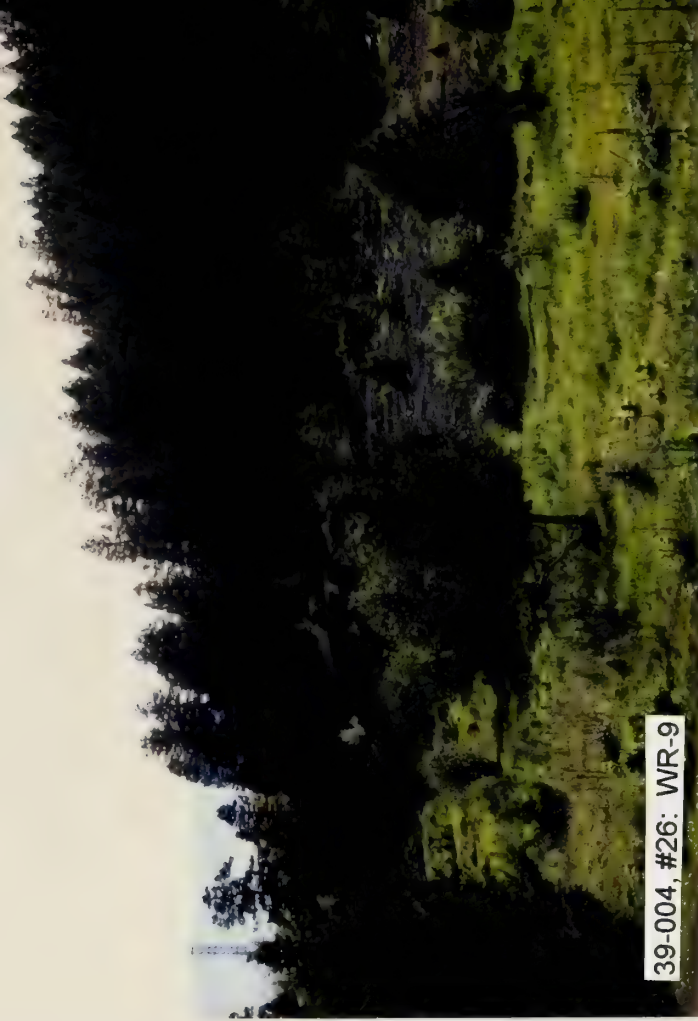


39-004, #24: TP-2

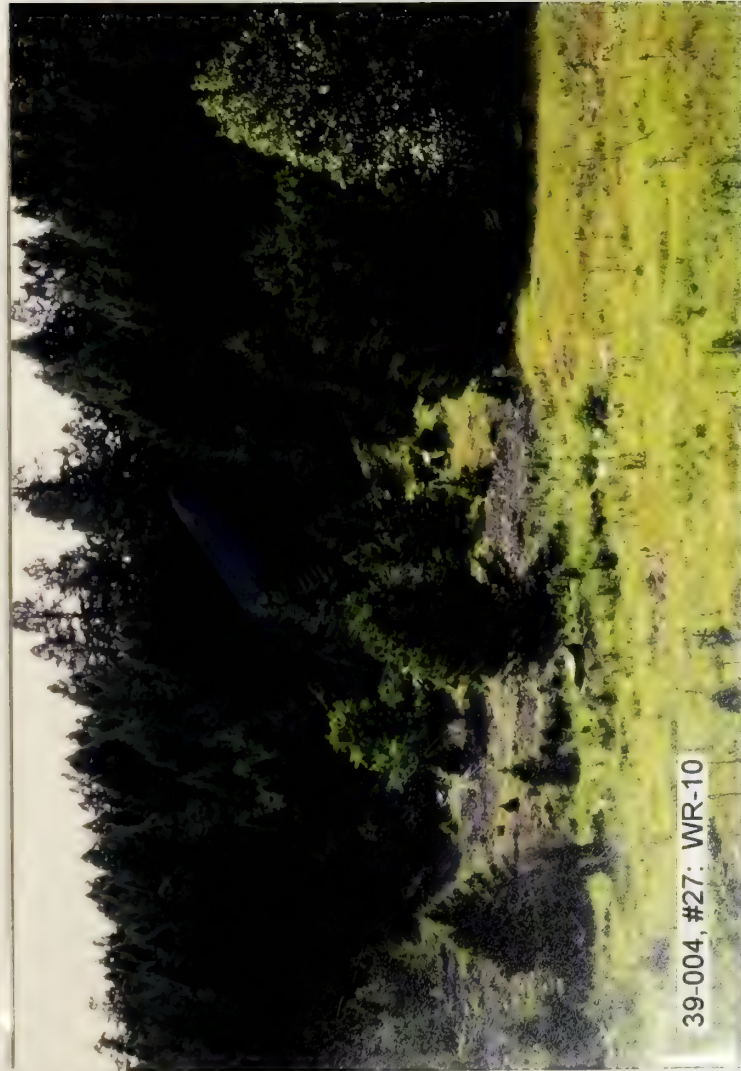




39-004, #25: TP-1



39-004, #26: WR-9



39-004, #27: WR-10



39-004, #22: TP-4









MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: NE NW S32 PA#: 39-052

Date: July 15, 1993 Time: 1320

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer  
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy; drizzly; cold (50°F);  
clearing up some later.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #16: SE-1 sample  
location, downstream of site; #17: Settling ponds/man-made  
wetlands; #18: Adit #1; #19: Adit #2; #20: Disturbed area (WR-3),  
facing east (upstream). Video Tape No. 4

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Stabilize and  
revegetate disturbed soils associated with the creek. Close HMOs.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): NE NW S32 PA#: 39-052

Legal Description: T 11N ; R 7W ; Sec. 32 , NE1/4 NW1/4 1/4

County: POWELL Mining District: OPHIR

Latitude: N 46° 40' 15" Longitude: W 112° 30' 30"

Primary Drainage Basin and Code: Carpenter Creek/17010201

Secondary Drainage Basin: Carpenter Creek

USGS Quadrangle map name(s): Ophir Creek

Mine Type/Commodities: Hardrock/Placer, Gold

Activity Status: Active      , Inactive/Exploration X , Abandoned      .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): USFS

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?       
Past Reclamation Activities? N/A

General site features: Elevation 5600' , Slope 5° in drainage ,  
Aspect East and West

Land use: Mining      , Recreational X , Residential      , Urban      ,  
Agricultural      , Other(Specify)     

Area of disturbed/unvegetated lands? 0.35 acres.

Dimensions: 15 feet x 457 feet

Predominant vegetation types: Ponderosa pine, Douglas fir on  
dump, raspberries, grass, thistle, wildflowers

Access: roads - good X , poor      , 4wd      , trail      .

Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on east and west side of perennial Carpenter Creek as it flows south through the site. Carpenter Crk. was placered during 1860-1870's, and evidence of this activity is on the site. The site is underlain by quartz monzonite.

Mining/milling history, ore type/tenor, host rock, gangue: Placering principally occurred between 1860-1880 and evidence of the placering is present on site. Recent trenching is also present as WR-3. The reasons for the adits were not determined.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 2, Comment 1 partially caved; other open  
Pits - Yes     , No X, #     , Comment       
Placers - Yes X, No     , #     , Comment Old, mostly revegetated  
Other - Yes X, No     , # 1, Comment Trench and spoils

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: Very old placering present. Adits and newer placering have occurred in the last 10 years.

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? Hg-amalgamation possible, but XRF analysis did not indicate presence of Hg.

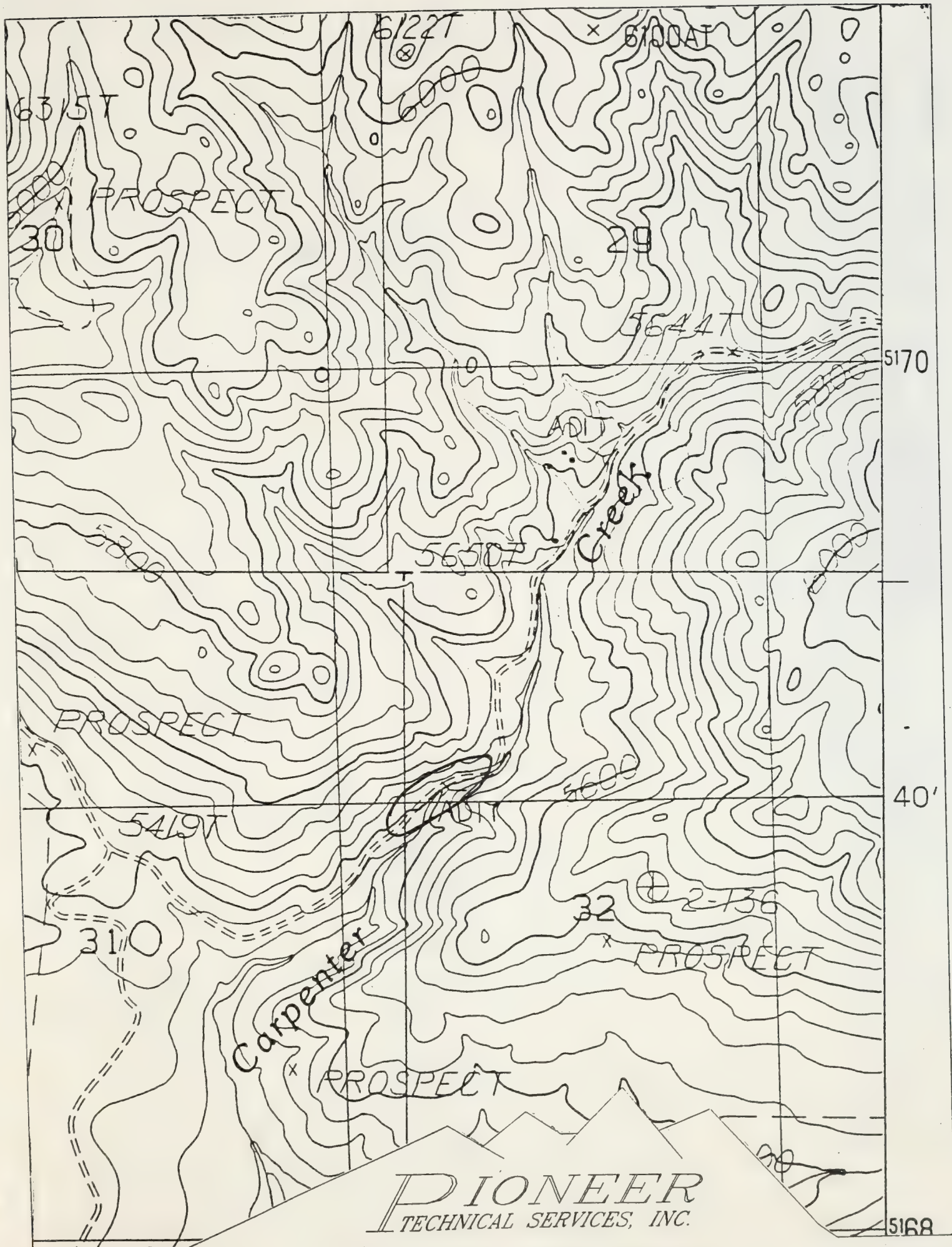
Montana Bureau of Mines and Geology  
Water Well Log Data

11/19/1993

Well No.	Location	Depth	Yield	Static Water Level
M:63055	10N 07W 04	40.0	30.0	11.00







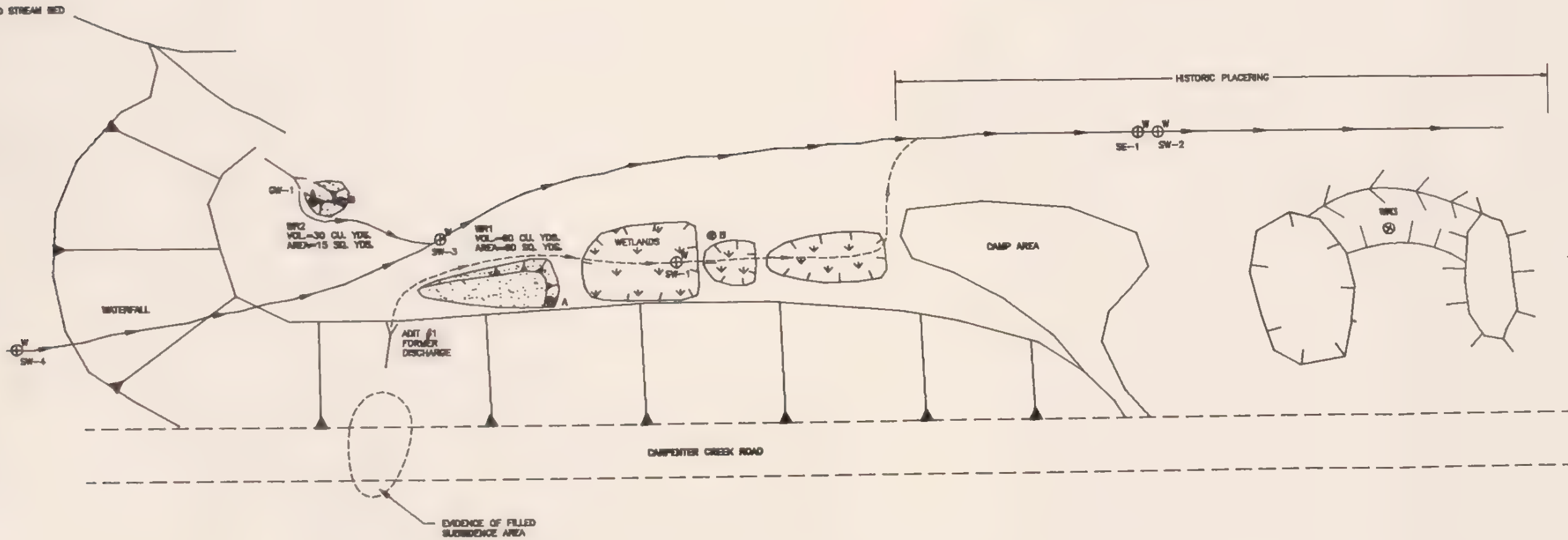
NE NW S32, P.A. NO. 39-052

T11N, R07W, SECTION 32

SCALE: 1" = 1000'



OLD STREAM BED



LEGEND	
	CLUMET
	LIGHT (LIGHT POLE)
	UTILITY POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	WOOD FENCE
	WIRE FENCE
	BUILDING
	BARRIER POST
	GATE
	EDGE OF ASPHALT
	EDGE OF GRAVEL
	SLOPE DIRECTION
	TAILINGS POND
	OPEN ADIT
	COLLAPSED ADIT
	OPEN SHAFT
	COLLAPSED SHAFT
	EXCAVATION
	WASTE ROCK DUMP
	COLLAPSED TIMBERS
	RAILS
	SOIL SAMPLE
	XRF SAMPLE
	WATER SAMPLE GROUND AND SURFACE
	DRAINAGE
	WATER WELL
	PONDING WATER
	VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

NE NW SECTION 32 PA# 39-052  
OPHIR DISTRICT POWELL COUNTY

PIONEER  
ENGINEERING CONSULTANTS

TDSH

DRAWN JTP DATE 18 NOV 83  
DESIGNED TPR JOB NO. 83-17  
APPROVED NSB F.B. NO.

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON  
SPOKANE





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



**SAMPLERS:** Bullock, Flammanq

[illegible]\* $\bar{n}$ -Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

**Comments or deviations from SOPs:** No lab samples submitted; all XRF samples indicated metal values well within background range. ND = Not Determined



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Adit #2  
discharge appears to be Carpenter Creek water.

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes     , No X, Number:      Identification:     

Groundwater wells within 4 miles?: Yes X, No     ;  
Number of well logs: 27

Distance to nearest well used for drinking? Approx. 2 miles to the  
nearest ranch; one well log within 1 mile is a cabin upgradient of site  
on BLM land.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh  
(meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable     , Possible     , Unlikely X.

Water pH was neutral coming out of adit and in stream; background metals  
concentrations in waste rock.

Other observations/notes: N/A



**SAMPLERS:** Bullock

[illegible]

FROM: Estimated (E) or Measured (M) from edit, sheet, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No sample was taken of water from Adit #1 because parameters resembled Carpenter Creek water. NM = Not Measured

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Carpenter Creek

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes X, No     , Name(s)/Description: Two of the man-made setting ponds contained standing water and have become wetlands.

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-1 and -2 are within Carpenter Creek floodplain.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)?     

High Flow: 5.0 cfs, Average Flow: 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; WR-2 is on bank of Carpenter Creek; material from WR-2 was used to make the banks of the wetland ponds.

Surface water draining onto or through waste sources: Yes X, No     , Describe: Water from Adit #2 flows across WR-2.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, wetland, stock watering

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? 200 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Small sedimentation problem observed from recent placering.



# SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	PH SU	SC $\mu\text{S}/\text{cm}$ @ 25°C	Eh mV	Temp °C	ALK. mg/L as $\text{CaCO}_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
SW-1	SW	Water in upper wetland pond	7.20	246	-010	17.3	NM	NM	N/A	N/A	Field Parameters
SW-2	SW	Stream below recent disturbance at old sluice downstream	8.32	293	-027	11.0	NM	NM	N/A	N/A	Field Parameters
SW-3	SW	Stream after confluence with adit flow	8.07	303	-037	11.0	NM	NM	N/A	N/A	Field Parameters
SW-4	SW	Flow upstream of site	7.33	309	-027	11.5	NM	NM	N/A	N/A	Field Parameters
SE-1	SE	Downstream of site	N/A	N/A	N/A	N/A	N/A	N/A	39-056-SE-1	07/15/93 1520	T-Metals
SE-500	SE	500 feet downstream of SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000 feet downstream of SE-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Only a sediment sample was taken downstream. Water parameters were good and remained fairly constant through the site.

NM = Not Measured

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Very small sedimentation ponds present to treat former Adit #1 discharge. Broad floodplain 1000' below mine could be used, but no AMD present.

Wetlands present: Yes X, No   , Describe: Four small man-made ponds are present down from Adit #1 - linked.

Carbonate rocks/soils: Yes   , No X, Describe:   

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10   ; 10-30 X; 30-100   ; 100-300   ; 300-1,000   ; 1,000-3,000   ; 3,000-10,000   ; 10,000 or greater   ; Comments   

Nearest residence(ft or miles)? Approx. 2 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed      high      moderate      low      none



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Dry	540	108	No	None
WR-2	None	Partial	135	130	No	None
WR-3	None	Dry	ND	ND	Yes	Low - coarse sand
Adit #1	None	N/A	N/A	N/A	N/A	N/A
Adit #2	None	N/A	N/A	N/A	N/A	N/A

**Notes and Clarifications:** Material from WR-1 was used to form berms in man-made wetlands; berms are beginning to be vegetated. Basins of wetlands are fully vegetated.  
 ND = Not Determined

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Beer  
and pop cans at campsite with fire ring

Accessibility - Fences, warning signs, closed roads? Easy access;  
adjacent to Carpenter Creek Road

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Bald Eagle</u>
Bat Habitat -	Yes <u>X</u> , No____, Comment <u>Open adits</u>

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>Not Rated</u>
Sport Fishery Classification -	<u>Not Rated</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Adit #1 and #2

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 1,  
types and locations: Steep cut from road down to stream and adit area

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 1, types and locations: Streambanks cut in old placer

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_

## **Bibliography**

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for NE NW Sec. 32, Prepared by Northern Engineering and Testing, May 23, 1988.

USGS, Greater Helena Mining Region, Montana, Bulletin 842, Author Unknown, Date Unknown, pp. 28-34.

USGS, Topographic Map, Ophir Creek, Montana, 7 1/2 minute Quadrangle, 1989.





LABORATORY ANALYTICAL DATA

NE NW S32  
PA NO. 39-052



NE NW Section 32 PA# 39-052  
 AMRB HAZARDOUS MATERIALS INVENTORY  
 INVESTIGATOR: PIONEER - BULLOCK  
 INVESTIGATION DATE: 07/15/93

SOLID MATRIX ANALYSES

Metals in soils  
 Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-052-SE-1	5 U	78.4	0.8 J	10.1	12.7	38 JX	15200	0.063 J	405	11 JX	22 J	7 UJ	43 J	NR
BACKGROUND	71	312	5.6	13	18	224	15800	0.296	1570	15	156	9 UJ	240	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

LEGEND

SE1 - Downstream of site.

BACKGROUND - From the Victory/Evening Star (25-010-SS-1).





**XRF ANALYSIS RESULTS**

**NE NW S32  
PA NO. 39-052**



XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
39-052-SE-1000		5687.67	16007.7	891.597		527.115 *	19891.4			92.1362 *	26.2068 *	853.141
39-052-SE-500		8636.33	13822	2071.4		629.158 *	24290.1		44.7464 *	104.511 *	36.2113 *	906.221
39-052-WR1-A		13979.5	21550.8	2411		622.293 *	36668.4		43.3833 *	98.9057 *	27.2147 *	900.543
39-052-WR1-B		10278.2	17058	1864.23		1252.19	39699.2			147.981	37.8576 *	712.783
39-052-WR3-A		14648.5	19689.7	2881.23		1043.83 *	31991.3		57.6489 *	112.338 *		881.694
39-052-WR-2		14801.9	21854.7	3816.57		1513.85	48154.5		80.3939 *	149.012	52.4183 *	760.917
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
39-052-SE-1000	85.9174				51.1881			923.071			9.57951 *	
39-052-SE-500	120.19				82.9789	155.862 *		1000.54			11.943 *	
39-052-WR1-A	150.556				72.9613			892.018			10.0589 *	
39-052-WR1-B	121.245		5.28227 *		74.1033			926.848			12.1339 *	
39-052-WR3-A	138.121				86.3624			851.805	92.3146 *		11.4911 *	
39-052-WR-2	111.073				93.0829			805.643			15.5993 *	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

NE NW S32  
PA NO. 39-052



# AIMSS SCORESHEET

SITE NAME:

NE NW SEC. 32

PA NUMBER:

39-052

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.000
6	GW - TARGETS	WELLS - 1 MI. x 2.5	2.5
7		WELLS - 1 TO 4 MI	26
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 28.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 0
<b>SURFACE WATER PATHWAY</b>			
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.001
16	SW - TARGETS	DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19		FISHERY	0
20		RECREATION	0
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 THRU 22 17
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 7
<b>AIR PATHWAY</b>			
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 50
27		LIKELIHOOD SCORE	LINES 25 + 26C 50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.000
29	AIR - TARGETS	POPULATION - 4 MILES	10
30		NEAREST RESIDENCE	0
31		WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 THRU 33 25
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 0
<b>DIRECT CONTACT PATHWAY</b>			
36		OBSERVED EXPOSURE	0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.000
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	0
41		NEAREST RESIDENCE	0
42		RECREATIONAL USE	5
43		TARGETS SCORE	SUM LINES 40 THRU 42 5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 0
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		(LINES 10 + 24 + 35 + 44) / 100,000 0.00



SITE NAME:  
PA NUMBER:

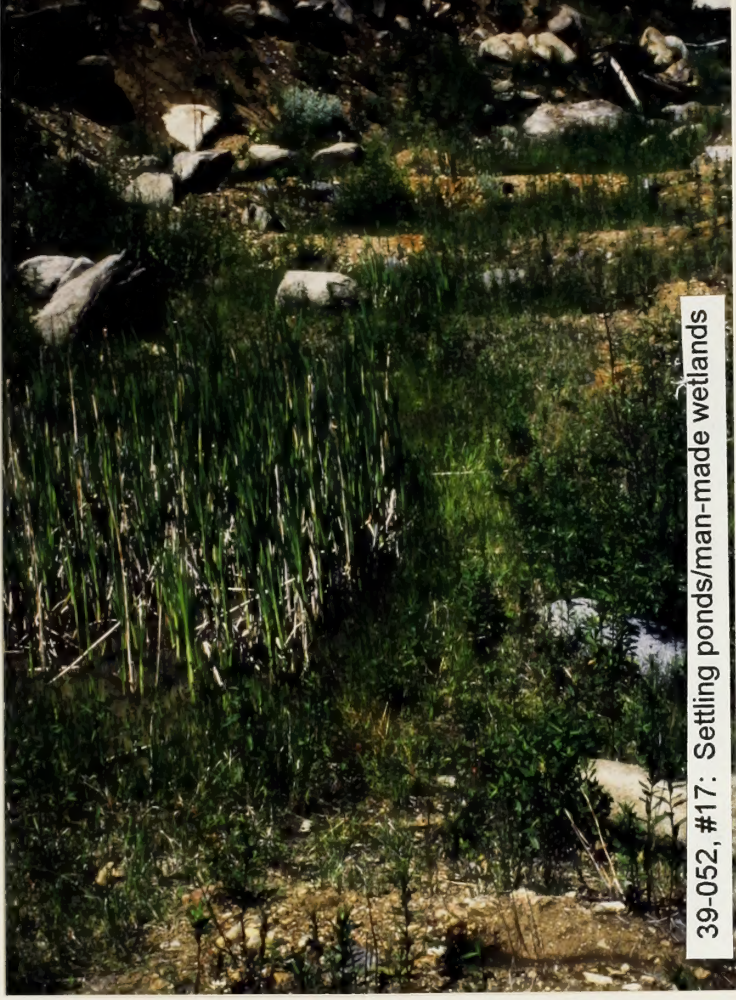
NE NW SEC. 32  
39-052

LINE NO.	SITE SAFETY			
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	175
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	5
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	17.50

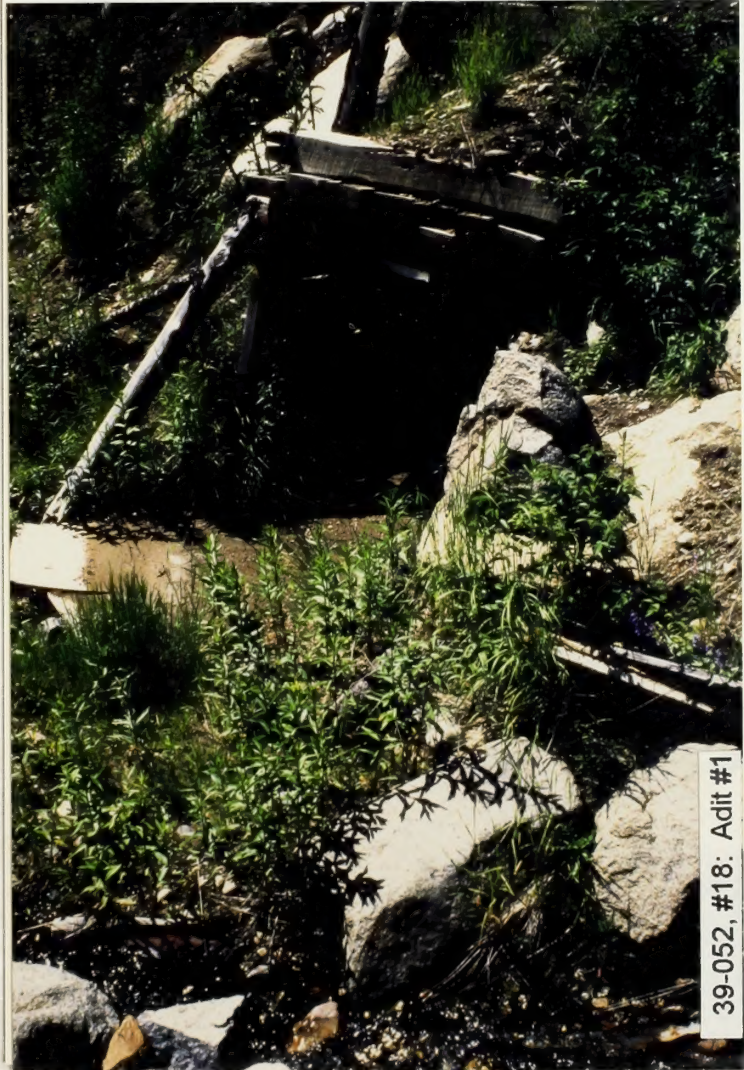




39-052, #16: SE-1 sample location



39-052, #17: Settling ponds/man-made wetlands



39-052, #18: Adit #1



39-052, #19: Adit #2



